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AI Revolution is leading to a University System Revolution

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Introduction

Time is a fundamental concept that humans have been grappling with since the dawn of civilization. It's a constant force that governs our lives, determining the rhythm of our daily activities, as well as the pace of change worldwide. Throughout history, time has been marked by events and periods of great upheaval, where the world was turned upside down. These moments often preceded a breakthrough revolution that changed the course of human history. Disruptive events could be addressed as trends that used to repeat in the course of history. What is interesting to highlight is the human behaviour in facing a revolution: at the beginning they prefer the known, avoiding changes. Only with time, humans begin to understand the positive effects of the revolution itself. This cyclical trend of resistance and acceptance has played out time and time again in human history.

Change is part of time as well as time is the unit of measure of change.

The philosopher Raymond Tallis describes this puzzling relationship as:

“It seems that change and time are inseparable: changes take time; are located and ordered in time; and they are separated by time. The inseparability of time and change is a kind of logical truth. Time, it has often been said, stops everything from happening at once”.¹

But, some changes have transformed the relationship with time, causing a break with the past.

One of the most significant breaks that transformed the relationship with time was the *Industrial Revolution*. Before it happened, the production was slow because it was limited by the capacity of human and animal power. The introduction of machines and automation in the productive system led to an exponential increase in the output, leading also to a massive transformation in society and economy. The quickness in production had as effect the increase of mass production and the development of new industries, leading to economic growth and prosperity. Not only production effect, but even perception. Time is now focused on efficiency and productivity. It's a commodity to be managed and optimized (example standardization of working hours). The Industrial Revolution also modified the way humans perceived change: no more as slow and gradual, but as rapid and constant. It's required of humans to quickly adapt to change pace, with the collateral effect of uncertainty and anxiety. The Industrial Revolution has slightly modified the relationship between time and change into a more complex one.

¹ Tallis, R. Time & change. Philosophy Now: A Magazine of Ideas. Retrieved from https://philosophynow.org/issues/115/Time_and_Change#:~:text=It%20seems%20that%20change%20and,ever%20from%20happening%20at%20once

A more recent breakthrough that turned upside-down the entire world was the advent of *technological devices*, followed by the *internet*. This has revolutionized the way humans interact with time and change. The ability to instantly communicate with anyone, anywhere in the world, has created an expectation of immediate responses and instant gratification. This has led to a culture of immediacy, where everything is available at the touch of a button. Time has become compressed and condensed, and people are able to accomplish tasks in a fraction of time it would have taken in the past. The environment in which all this took place is called *globalization*, that means: “The growing interdependence of the world’s economies, cultures, and populations, brought about by cross-border trade in goods and services, technology, and flows of investment, people, and information”². New technological devices and the internet have been just the accelerator of an already quick process started a few decades before, that brought the countries all over the world closer together. Globalization, with its more recent tools, has further exponentially increased the Industrial Revolution effects: economic growth, prosperity, rapid and constant changes.

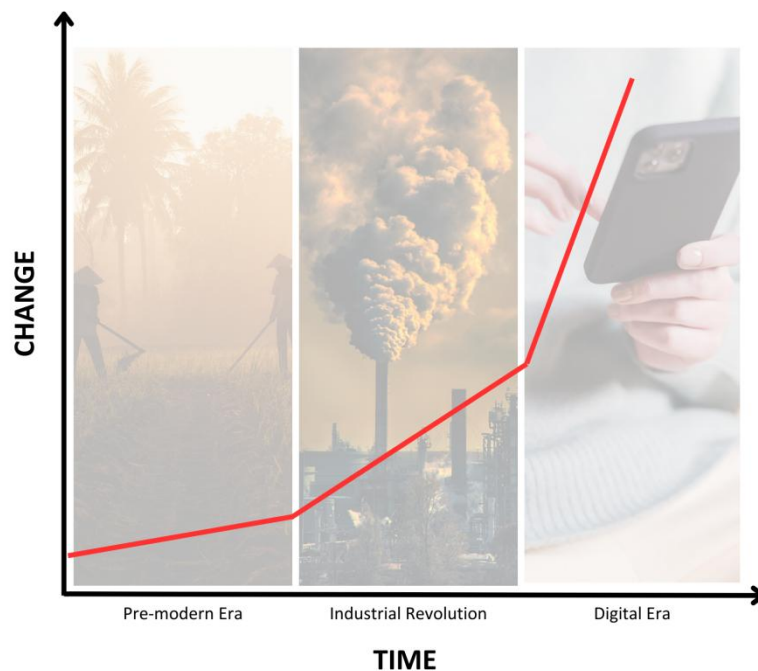


Figure 1 Time&Change relationship

² Peterson Institute for International Economics. (2021, August 24). What is Globalization? And how has the Global Economy Shaped the United States. Retrieved from <https://www.piie.com/microsites/globalization/what-is-globalization>

The insights on the historical periods we've just analysed suggest a relationship as shown in the red-line of **Figure 1**. The two breakthrough revolutionary events we've previously analysed have increased the amount of change in the same time-lapse, transforming the perception of it as quicker. Time-change link has become exponential and day after day the line becomes even more sharp.

Today, we're on the edge of the Digital Era, facing the beginning of a new breakthrough revolution that is going to change, in some way, our future. Coherently with the trend we've presented, we might foresee an extra sharpening in the red-line, as well as a further extremization of time and change perception, economic growth, prosperity, rapid and constant changes. But concretely, what will change?

Before introducing the topic of this dissertation, we deem it necessary to present some useful words and theories that will help us in better understanding the subject and will give us some good reading keys.

Starting from the three words, we are talking about *Technology*, *Innovation*, and *Hyper-connectivity*.

TECHNOLOGY

"The application of scientific knowledge to the practical aims of human life or [...] to the change and manipulation of the human environment"³.

Nowadays, technology is part of our daily life and it allows the use of new tools, new techniques, problem-solving systems, meeting needs, and improving the quality of life. Technology presence may be defined as *ubiquitous* - ever-present - changing the way we live, work, communicate, and interact with each other. *Efficiency* and *productivity* are the key-words in it: we can do more with less time and resources.

The main driver developed within technology is *innovation*. It's the introduction of new ideas, new products, new processes able to bring a positive change in society and leading to a revolution on a daily basis. In fact, technology is constantly evolving in an ongoing process of discovery and improvement, shaping our world in new and exciting ways.

³ Encyclopaedia Britannica. Technology. Retrieved from <https://www.britannica.com/technology/technology>

INNOVATION

“Process by which a domain , a product, or a service is renewed and brought up to date by applying new processes, introducing new techniques, or establishing successful ideas to create new value”⁴.

It’s a driving force of progress and growth bringing change and improvements in our lives. It’s the ability to create something new and valuable, by exploring new ideas, methods, and processes. Innovation has been the catalyst for some of the greatest advancements in human history, from the invention of the wheel to the creation of the internet.

In today’s society, innovation is more important than ever before. The constantly changing nature of our world wants us to adapt to new challenges and to take advantage of new opportunities. Innovation is the key to achieve this, allowing us to develop new products, services, and technologies that can meet the needs of our ever-changing world.

Innovation also contains the concept of *serendipity*. It is:

“The fact of finding interesting or valuable things by chance”⁵.

While innovation requires both creativity and the ability to recognize and act on unexpected opportunities, serendipity is the result of being open-minded and receptive to new ideas that can lead to unexpected discoveries.

Serendipity can also play a role in the commercial success of innovations. While many innovations are the result of deliberate planning and execution, others may emerge unexpectedly and require a different approach to commercialization. Being flexible and being able to adapt to unexpected circumstances can be the key to success.

The most emblematic case of serendipity is related to the discovery of penicillin, by Alexander Fleming in 1928.

⁴ Innolytics AG. What is Innovation? Retrieved from <https://innolytics.net/what-is-innovation/>

⁵ Cambridge Dictionary. Serendipity. Retrieved from <https://dictionary.cambridge.org/dictionary/english/serendipity>

HYPER-CONNECTIVITY

“[...] everything is talking: person to person, person to machine and machine to machine. These interactions are 1:1, 1:many and many:1. [...] To put it into perspective, we move more information in a day than Twitter does in a month - zettabytes of information”.⁶

It's the state of *being constantly connected* to the internet regardless of the location and the vast network of devices that it supports. Not only people, but also organizations and machines and this has brought about many changes in the way we live and work, from the rise of social media and online communities to the increasing reliance on cloud computing and remote work. Its ability to access information and resources from anywhere in the world has enabled new forms of collaboration, knowledge-sharing, and innovation. Hyper-connectivity has had an impact also on the growth of new industries and the transformation of traditional ones.

Hyper-connectivity is part of our daily lives: from digital tools to IoT (Internet of Things), from smart cities to industry 4.0. It has reached all the main aspects of the modern era.

Digital tools and hyper-connectivity mean being connected 24/7 and accessing information anytime from anywhere in the world. Some examples of this relationship are social media, e-commerce and voice assistants.

Internet of things is:

“the collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves. Thanks to the advent of inexpensive computer chips and high bandwidth telecommunication, we now have billions of devices connected to the internet. This means everyday devices like toothbrushes, vacuums, cars, and machines can use sensors to collect data and respond intelligently to users.

The Internet of Things integrates everyday “things” with the internet”⁷.

⁶ Ranadive, V. (2013, February 19). Hyperconnectivity: the future is now. Forbes. Retrieved from <https://www.forbes.com/sites/vivekranadive/2013/02/19/hyperconnectivity-the-future-is-now/?sh=15e9144e30ad>

⁷ Amazon Web Services. What is IoT (Internet of Things)? Retrieved from <https://aws.amazon.com/what-is/iot/>

Hyper-connectivity allows communication among devices in a seamless and secure way.

Smart cities use ICT for a better quality of life and to better control the environment they're in. Hyper-connectivity is the key enabler of smart cities because it allows the communication and the integration of devices, as well as new services and businesses.

Industry 4.0 is:

"the "smart" and connected production systems that are designed to sense, predict, and interact with the physical world, so as to make decisions that support production in real-time. [...] It increases productivity by reducing downtime and maintenance costs"⁸.

So, hyper-connectivity enables machines and systems to communicate with each other and with human operators in real-time, leading to increased efficiency and productivity.

In conclusion, we can say that technology, innovation, and hyper-connectivity are all interconnected and play a crucial role in shaping our world. They are all essential components of our modern society, enabling us to achieve unprecedented levels of productivity and efficiency while also opening up new avenues for growth and development. As technology continues to evolve and hyper-connectivity becomes more ubiquitous, we can expect even more exciting breakthroughs and innovation to emerge.

The three words overview is the basis for the understanding of the next three models we're presenting and to better focus and go in depth in the dissertation topic.

The models we're presenting are: The Solow Model, The Knowledge Economy Model, The Fourth Industrial Revolution Model.

THE SOLOW MODEL

The Solow Model explains economic growth and how it differs among developing and advanced countries. From a first sight, the model highlights that developing countries grow quicker than advanced ones. The Solow Model is a simplified framework of reality that helps us in understanding these dynamics.

The model's aim is to investigate the output. To obtain an output, we first need to take a look to the inputs involved:

L: labor;

e: education;

⁸ UNCTAD. What is "Industry 4.0" and what will it mean for developing countries? Retrieved from <https://unctad.org/news/blog-what-industry-40-and-what-will-it-mean-developing-countries>

(The more educated people are, the more effective labor is. $L \cdot e =$ Human Capital);
k: physical capital (Ex. Factories, tools ...);
A: ideas/knowledge (How to combine capital and labor to produce a valuable output).

What's the impact of physical capital on the model?

We keep all variables constant but k.

So, the function is:

$$Y=f(k)$$

The relationship between output and physical capital is *directly proportional*; if k increases, also output increases and vice versa. However, the increase in the output is not the same as the increase in capital. In fact, it increases at a diminishing rate. It means that each added capital increases output less than the unit before - *Iron logic of diminishing returns*. So, we have to adjust the previous function into:

$$Y=\sqrt{k}$$

In a graph:

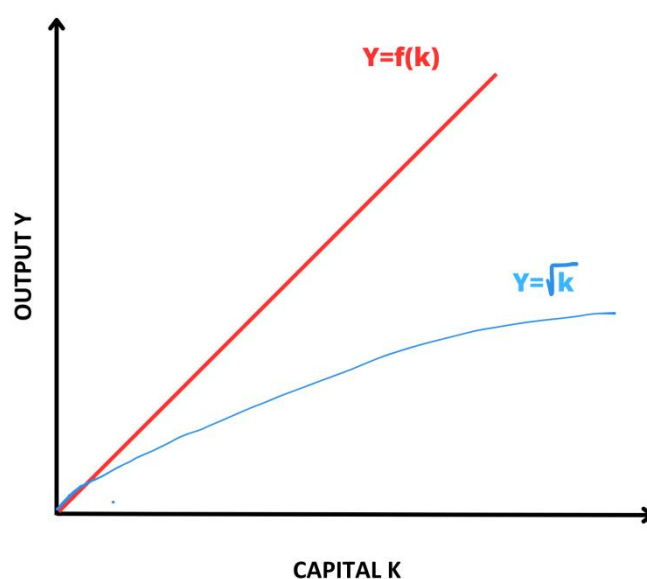


Figure 2: Direct proportionality and Iron logic of diminishing returns.
Created by Francesca Angusti using Canva.

So, the marginal product generated from this relationship decreases as the capital increases: $K=4, Y=2$; $K=9, Y=3$ [...].

This explains how it is possible that a developing country grows at a faster pace than an advanced one.

This is not the only negative aspect of K. In fact, K deteriorates, and so it depreciates. The relationship between depreciation and capital is directly proportional. The more capital, the more depreciation. To face depreciation an investment is required.

As long as investment is greater than depreciation, the capital stock grows. When investment equals depreciation, we reach the *steady-state level of capital* and so the *steady-state level of output*. At this point no new capital is being created.

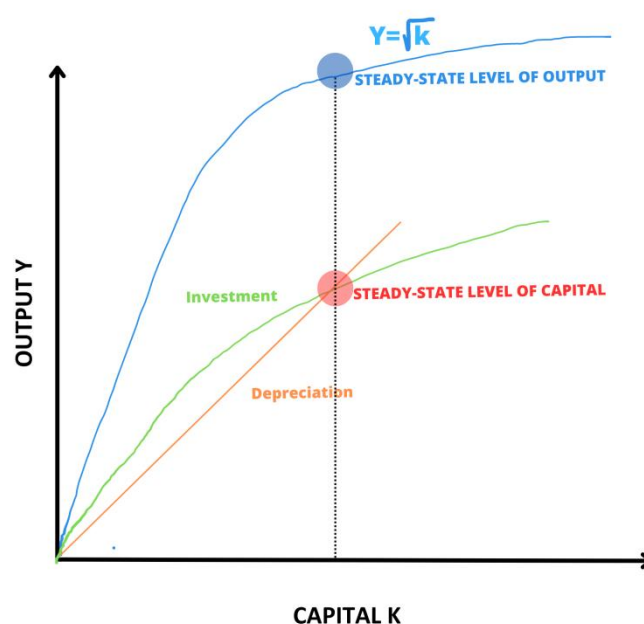


Figure 3: Steady-state level.
Created by Francesca Angusti using Canva.

On the left side of the steady-state level, $investment > depreciation$, capital stock is growing. Not all investment amount is spent to face depreciation, so new output is created. As we get closer to the steady-state, the amount of investment involved in facing depreciation increases, causing a diminishing in output production. On the right side of the steady-state, $investment < depreciation$, capital stock is shrinking. K makes the economy grow just for a temporary period of time.

How does human capital influence economic growth?

We've already stated that high levels of education can lead to a higher output. However, as for k , also human capital is related to the iron logic of diminishing returns, that will converge in a steady-state level where no output will be produced. So, we can assume that all developing countries are catching up to advanced countries, but historical data doesn't show a growth trend for everyone.

It's important to make a distinction between *catching up growth* and *cutting edge growth*.

Catching up growth: a poor country at the starting point of **Figure 3**. It's high expectations for growth, followed by a slow down as it approaches the steady-state level.

Cutting edge growth: wealthy economies keep growing, even if at a lower pace. This happens thanks to ideas. The fastest new ideas are formed, the highest cutting edge is reached.

Ideas shift the output line up. In the formula:

$$Y = A * \sqrt{k}$$

An increase in the output line means an increase in the investment line that will reach a steady-state level of capital more on the right.

Ideas increase:

- productivity of a given capital stock;
- and investment that increases capital accumulation.

If ideas keep increasing, a continuous shifting upward will be noticed. In this way, countries will always be on the left side of the steady-state, keeping growing.

The Solow Model relates with the three words presented before.

Technology (k) is one of the key drivers of economic growth. In fact, technological progress leads to increases in productivity, and economic growth as well. Innovation (A) means introducing new products, ideas and ways of doing things. It causes the shift of the output line.

Hyper-connectivity is the consistency factor that links economies from all over the world. The rapid exchange of ideas and innovations made possible by hyper-connectivity can accelerate the diffusion of technology across countries, which can lead to a faster economic growth.

THE KNOWLEDGE ECONOMY MODEL

The knowledge economy can be defined as:

“a system of consumption and production that is based on intellectual capital”⁹.

This model considers knowledge as a key driver for economic growth and highlights the difference in knowledge level among developing and developed economies. The firsts have a lower level that is also reflected in the job types available.

Its focus is on creating and using knowledge, rather than solely producing goods and services. To do so, a highly educated workforce and a supportive environment for research and development is necessary. The increasing knowledge is associated with the birth of the digital era and the use of technology in all of its aspects. It is also associated with the concept of innovation as the development and commercialization of new ideas and technologies as essential to succeed in the knowledge economy.

⁹ Kenton, W. (2020, November 29). Knowledge Economy. Investopedia. Retrieved from <https://www.investopedia.com/terms/k/knowledge-economy.asp>

The knowledge economy model represents a shift toward a more intangible and intellectual form of economic activity, where the creation and management of knowledge and information are the primary drivers of growth and prosperity. In the past, traditional economies were mainly dependent on the natural resources and physical labor of its people to produce goods and services. However, the rapid development of technology and globalization have brought about a shift towards a knowledge-based economy. This new economy is based on the production, distribution, and use of knowledge, ideas, and information.

The knowledge economy model is based on the idea that knowledge is the most important factor in economic growth and development, this model emphasizes the importance of investing in education, research and development, and technology to create new ideas and knowledge that can be used to improve productivity, create new products and services, and increase overall economic growth.

One of the key features of the knowledge economy model is the importance of *intellectual capital*. Intellectual capital includes both human capital and intangible assets such as patents, trademarks, and copyrights. Human capital refers to the skills, knowledge, and experience of the workforce. Investing in education and training to improve the skills and knowledge of the workforce is seen as essential in the knowledge economy. This includes not only formal education, but also informal learning through experience and on-the-job training.

Another important aspect of the model is its emphasis on *innovation*. Innovation is the process of creating new ideas, products, and services that have commercial value. In the knowledge economy model, innovation is seen as a key driver of economic growth and competitiveness. This includes both technological and non-technological innovations, such as new business models and processes. It also highlights the importance of *information and communication technology*. ICT plays a crucial role in the knowledge economy by facilitating the production, distribution, and use of knowledge. It enables the creation and sharing of information and ideas on a global scale, making it easier for businesses to collaborate and for individuals to access information and resources from anywhere in the world. ICT is also seen as a key enabler of innovation, as it makes it easier for businesses to develop new products and services and for individuals to create and share new ideas.

One of the challenges of the knowledge economy model is the need for *continuous learning and adaptation*. In the past, workers could rely on their skills and experience to carry them through their entire careers. In this model, skills and experience become outdated quickly as new technologies and ideas emerge. This requires workers to engage in lifelong learning and to be adaptable to new technologies and ways of working.

The knowledge economy model also has significant implications for government policy. Governments, in fact, must invest in education and R&D to create a skilled workforce and promote innovation. They must also create an environment that is conducive to innovation and entrepreneurship, including strong intellectual property protections, a supportive business environment, and access to financing.

Additionally, governments must ensure that their citizens have access to the ICT infrastructures and resources they need to participate fully in the knowledge economy model.

So, the knowledge economy model emphasizes the importance of knowledge, innovation, and ICT in economic growth and development. It requires a highly educated and skilled workforce, a supportive environment for R&D, and continuous learning and adaptation. Governments must invest in all this in order to create an environment that is conducive to innovation and entrepreneurship to promote economic growth and prosperity in it.

THE FOURTH INDUSTRIAL REVOLUTION MODEL

When we talk about Fourth Industrial revolution, we're referring to "the blurring of boundaries between the physical, digital, and biological worlds. It's a fusion of advances in Artificial Intelligence (AI), robotics, the Internet of Things (IoT), Web3, block chain, 3D printing, genetic engineering, quantum computing, and other technologies. It's the collective force behind many products and services that are fast becoming indispensable for modern life"¹⁰.

It describes the fusion of technological advancements, innovation, and hyper-connectivity to create a new era of economic and societal progress. This new era is characterized by a rapid pace of change, a higher degree of complexity, and a need for a highly skilled and adaptable workforce. The model is built on the previous three industrial revolutions, focusing on the integration of digital technologies with physical systems, resulting in a hybrid.

The fourth industrial revolution model's heart is technology and its key drivers are AI, IoT, blockchain, and 3D printing. The combined use of those enables a significant advancement in systems and processes, increasing productivity gains.

Another crucial component of the fourth industrial revolution model is innovation. It enables the creation of new products and services to meet evolving consumer needs and preferences. The model doesn't stand only in technological advancements, but it also involves new business models, processes and structures. The involvement of innovation is due to a collaborative and open approach where institutions like government, businesses and universities work together in order to offer new solutions and way-of-doing things.

One more driver of the fourth industrial revolution model is hyper-connectivity and it refers to the growing and increasing interconnectedness of individuals, businesses,

¹⁰ Salesforce. What is the fourth industrial revolution? Retrieved from <https://www.salesforce.com/blog/what-is-the-fourth-industrial-revolution-4ir/>

and systems enabled by digital technologies. It is driven by the use of internet and mobile devices that have enabled instant communication and collaboration across and above geographical boundaries. Thanks to hyper-connectivity businesses can reach new markets and collaborate with many partners across the globe; individuals, instead, have greater access to information, services and opportunities. Plus, the use of big data analytics and cloud computing has also provided the ability to store and analyze large amounts of data in real-time.

The model also has significant implications for the future of work and education. In fact, its hybrid nature - digital and physical in one - is transforming the nature of work and the skills required to perform it. The demand for highly skilled and adaptable workers is increasing, with a focus on skills such as critical thinking, problem-solving, creativity, and collaboration. The rise of automation and robotics is also changing the nature of work, with the potential for job displacement in some sectors.

Education has to adapt to the fourth industrial revolution by providing students with the skills and knowledge required to succeed in a rapidly changing and technology-driven world. The focus should be on developing the skills required for the digital age as well as the soft skills required for collaboration and innovation. Lifelong learning is also becoming increasingly important, as individuals need to continuously adapt to changing technologies and work environments.

This general overview will help us to better investigate the topic of this dissertation: *AI in relation to the educational system*.

The first chapter focuses on the university system, how it is structured, its main characteristics and a comparison between the Italian system with other systems worldwide. We interview students from different universities to get better and realistic insights on the system they're in and we conclude the chapter with a personal overview and solution.

The second chapter focuses on AI. We want to understand what it is, how it is structured and its main characteristics. After a general profiling, we investigate how technology is into university nowadays and how it will be in the next few years. The focus is to understand if university will be affected or not by AI and, in case it will be, how and how much.

The third chapter is cheeky. We ask Artificial Intelligence to foresee its future in education. AI creates a story with a student as the main character in a relatively short period of time: five years from now. What does the future hold for us?

Chapter I

University System

What a University System is

Universities have been a cornerstone of modern society for centuries, providing a space for *learning, research, and innovation*. These institutions are often seen as the birthplace of new ideas and the training ground for the leaders of tomorrow. With the ever-increasing complexity of modern life, the role of universities in society has become even more critical. Today's universities not only *educate students*, but also contribute to *scientific research and innovation*, serve as *economic engines*, and provide opportunities for *civic engagement*.

The importance of universities in modern society is reflected in the significant public and private investment made in higher education. Governments around the world invest heavily in universities, recognizing their role in driving economic growth and social development. In turn, universities strive to meet the needs of society by providing quality education, conducting research that addresses societal challenges, and engaging with local communities.

As we look to the future, universities face significant challenges and opportunities. Advances in technology, changing social and economic contexts, and evolving students all impact the role and function of universities in society, examine their role in shaping the future, and consider the challenges and opportunities they face.

Through the production and dissemination of new knowledge, universities play a vital role in fostering innovation and creativity. Not only generating new ideas, universities are also responsible for equipping students with the skills and knowledge necessary to become motivated and resourceful graduates who can apply their learning in various sectors, including businesses, non-governmental organizations, and government agencies.

Two of the main roles of university are:

- “ The culture of university influences its success in producing innovation and can influence the culture of a region;

- A university does not merely prepare young people for the wide variety of roles in an innovative economy; its higher mission is to “discover and invent the future.” [...] ”¹¹.

University's main purpose is to provide a *comprehensive and coordinated approach* to higher education. This includes offering a wide range of degree programs and research opportunities, as well as facilitating the exchange of ideas and knowledge among faculty and students across different campuses. University systems often provide centralized services and resources - for example libraries, IT, and support services - and ensure that each campus has the resources it needs to provide a high-quality education to its students.

University also plays an important role in *promoting collaboration and innovation*. By bringing together researchers and scholars from different disciplines and institutions, university systems foster interdisciplinary research and innovation that can lead to new discoveries and technologies. This collaboration also helps to attract top talent to the system, as researchers and students are drawn to the opportunities for collaboration and the resources and facilities available across the entire system.

Plus, university systems often have a significant *impact on the economy* of the region or state in which they operate. By providing a highly educated workforce and conducting cutting-edge research and development, universities can drive economic growth and attract new businesses and industries to the area. In addition, the research conducted by universities can lead to the creation of new products and services, as well as the development of new technologies that can be commercialized and contribute to the economic development.

University main characteristics

Universities are complex institutions that serve a variety of purposes within society. Some of the main characteristics of universities include their role as centres of *learning and research*, their focus on preparing students for a wide *range of careers*, and their contribution to *innovation and economic growth*.

As centres of learning, universities provide students with access to a broad range of knowledge and expertise across a variety of disciplines. They also offer opportunities for students to engage in independent research and inquiry, developing critical thinking skills and the ability to analyse and interpret complex information.

¹¹ National Academies Press. Trends in the innovation ecosystem: Can past successes help inform future strategies? Chapter 4: The role of Universities. Retrieved from <https://nap.nationalacademies.org/read/18509/chapter/5>

Universities play an important role in conducting *scientific research* and *developing new ideas and technologies* too. Through partnerships with industries and other institutions, universities contribute to the creation of new products and services and help drive economic growth and development.

Another key characteristic of universities is their focus on preparing students for the professional world. Many universities offer career-focused programs and internships that provide students with practical skills and experience that they can use to pursue their career in a variety of fields.

Finally, universities also serve as important *cultural and social institutions*, promoting civic engagement and encouraging active participation in public life. Through community outreach and other initiatives, universities help to build strong and vibrant communities and contribute to the overall well-being of society.

We list all the main characteristics:

- **Operational environment:** universities have a unique operational environment that is focused on education, research, and community engagement. This environment includes academic departments, research centres, administrative offices, and student services, all *working together* to support the university's mission;
- **Network, collaborations and partnerships:** universities collaborate with other institutions, industries, and government agencies to share resources, knowledge, and expertise. These collaborations often lead to new research opportunities, innovative solutions, and enhanced academic programs;
- **Quality of life:** universities provide a stimulating and supportive environment for students, faculty, and staff. For example, the access to resources such as libraries, athletic facilities, and health services, as well as opportunities for social and cultural activities;
- **Interdisciplinary approach:** universities encourage interdisciplinary approaches to teaching and research, which allows students and faculty to collaborate across different fields of study. This approach can lead to new insights, discoveries, and solutions to complex problems;
- **Culture of research:** universities have a culture that values research and scholarly activity. Faculty and students are encouraged to conduct research, publish their findings, and participate in academic conferences and workshops;
- **High caliber talent:** universities attract and retain high caliber talent, including top faculty, researchers, and students from around the world. This talent brings diverse perspectives and experiences to university community and contributes to the institution's intellectual vitality;
- **Infrastructure and facilities:** universities invest in state-of-the-art infrastructure and facilities to support their academic and research programs. This includes modern classrooms, laboratories, computing and networking resources, and other specialized facilities;
- **Financial resources:** universities require significant financial resources to support their operations, including funding for academic programs, research

initiatives, and student services. These resources come from a variety of sources, including government funding, philanthropy, and tuition and fees;

- **Commitment to quality:** universities are committed to maintain high standards and ensuring that their graduates are well-prepared for their careers. This commitment to quality is reflected in the university's curriculum, faculty, and student support services.

In conclusion, we can summarize that universities possess a unique operational environment focused on education, research, and community engagement, foster collaborations and alliances to enhance knowledge sharing, provide a supportive quality of life for students and faculty, promote interdisciplinary approaches to drive innovation, cultivate a culture of research, attract higher-caliber talent, invest in advanced infrastructure, rely on diverse financial resources, and maintain a strong commitment to academic excellence, all contributing to their vital role in society.

Technology, innovation and hyper-connectivity

It is interesting to dive into the relationship between university and the three words mentioned and explored in the introduction - Technology, Innovation, and Hyper-connectivity - to further understand if the university system is in line with society's vision or if it needs to be reshaped.

University&Technology

The relationship between universities and technology is a dynamic and symbiotic one, with each influencing and shaping the other in significant ways. Universities have long been at the forefront of technological advancements, playing a crucial role in driving innovation, research, and development in various fields.

First and foremost, universities serve as hubs of knowledge and expertise, bringing together scholars, researchers, and students from diverse disciplines. They provide an environment conducive to exploration and discovery, where cutting-edge technologies are developed, tested, and refined. Faculty members and researchers engage in groundbreaking research projects that push the boundaries of knowledge and contribute to technological advancements.

Moreover, universities play a pivotal role in educating and training the next generation of technology professionals. They offer specialized degree programs in fields such as computer science, engineering, information technology, and data science, equipping students with the skills and knowledge necessary to compete in

the rapidly evolving tech landscape. Universities also provide hands-on experiences, research opportunities, and access to state-of-the-art laboratories and facilities, allowing students to apply theoretical concepts to practical scenarios and concretely develop innovative solutions.

Universities often collaborate with industry partners, strengthening connections between academia and the technological sector. These collaborations can be presented as research partnerships, joint projects, or event technology transfer initiatives, where universities commercialize their research outcomes and contribute to economic growth and development. Collaborations provide valuable real-world insights, access to resources and expertise, and opportunities for students to gain practical experience through internships and cooperative education programs.

The influence of technology on universities is equally profound. The advent of digital technologies has transformed the way universities operate, teach, and engage with their communities. Online learning platforms, virtual classrooms, and digital libraries have expanded access to education, enabling students to pursue degrees remotely and engage with course materials and resources from anywhere in the world. Technology has also facilitated collaboration and knowledge sharing among researchers, allowing for global connectivity and interdisciplinary exchanges.

Additionally, universities harness technology to streamline administrative processes, enhance communication and information sharing, and improve the overall efficiency of their operations. They leverage advanced data analytic, cloud computing, and artificial intelligence to manage vast amounts of information, personalize learning experiences, and support research findings, with online publications, open-access repositories, and digital journals facilitating the rapid exchange of knowledge and accelerating the pace of scientific advancements.

So, the relationship between universities and technology is deeply intertwined and mutually beneficial. Universities serve as mix of technological innovation, driving research and development, and nurturing the next generation of tech professionals. At the same time, technology empowers universities to expand educational opportunities, collaborate globally, and optimize their operations. As technology continues to advance, universities will remain at the forefront of harnessing its potential, shaping the future, and addressing societal challenges through the transformative power of technology.

University&Innovation

The relationship between universities and innovation is one of profound significance, fueled by a combination of deliberate efforts and serendipitous discoveries. Universities serve as vibrant ecosystems that push creativity, exploration, and the generation of new ideas, making them fertile grounds for innovation to flourish.

At the heart of this relationship is the academic environment that universities cultivate. They provide harmony among intellectual curiosity, academic freedom, and diverse expertise across disciplines, which encourages interdisciplinary collaboration and sparks innovative thinking. Through research endeavours, universities push the boundaries of knowledge, exploring uncharted territories and uncovering breakthroughs that lead to novel solutions, technologies, and inventions.

Universities also play a pivotal role in nurturing and supporting entrepreneurial activities. Many universities have established innovation and entrepreneurship centres, incubators, and technology transfer offices to bridge the gap between academia and the commercial world. These initiatives provide a platform to transform ideas into viable products or services, promoting a culture of innovation and translating academic research into real-world applications.

Also, universities serve as catalysts for regional and societal innovation. They contribute to the economic growth of their surrounding communities by attracting talent, generating jobs, and creating collaborations with local industries and startups. Universities also engage in community outreach programs, partnering with local businesses, non-profits, and government agencies to address societal challenges and drive innovation for the benefit of society as a whole.

Serendipity, the occurrence of unexpected and valuable discoveries by chance, often plays a significant role in the innovation process within universities. The diverse mix of researchers, students, and scholars from various backgrounds and disciplines creates an environment ripe for serendipitous encounters and unplanned collaborations. Chance encounters, casual conversations, and interdisciplinary exchanges can lead to unexpected connections and serendipitous discoveries that fuel innovation.

Universities provide the infrastructure and resources necessary to support innovative endeavours. State-of-the-art laboratories, research facilities, and access to cutting-edge technologies enable researchers to experiment, test hypotheses, and develop prototypes. Libraries, archives, and databases offer vast repositories of knowledge and information, providing researchers with the necessary tools to explore new frontiers and build upon existing knowledge.

Overall, we can state that the relationship between universities and innovation is multifaceted and dynamic. Universities support innovation, promoting a culture of creativity and providing the necessary resources and support for researchers and students to pursue novel ideas. Additionally, the element of serendipity further enhances the innovative potential within universities, allowing for unexpected discoveries and breakthroughs that contribute to the advancement of knowledge and the betterment of society.

University&Hyper-connectivity

The relationship between universities and hyper-connectivity is transformative, reshaping the landscape of higher education and opening up new avenues for collaboration, communication, and knowledge sharing. Hyper-connectivity, driven by advancements in technology and the proliferation of the internet, has revolutionized the way universities operate, interact, and engage with their stakeholders.

One of the key aspects of hyper-connectivity is the seamless and instant connectivity that it offers. Universities leverage this connectivity to bridge the physical and geographical divides, enabling global collaboration and networking. Through digital platforms, online learning management systems, and video conferencing tools, universities can connect students, researchers, and scholars from different parts of the world, fostering a rich exchange of ideas and perspectives. This interconnectedness not only enhances the educational experience, but also promotes cultural diversity and global understanding.

Hyper-connectivity has also transformed the way universities disseminate knowledge and conduct research. With the rise of open access journals, digital libraries, and online repositories, researchers can share their findings with a global audience, accelerating the pace of scientific discovery. The ease of accessing vast amounts of information online has democratized knowledge, empowering students and researchers to explore diverse sources and collaborate across disciplines.

Additionally, hyper-connectivity has opened up new opportunities for universities to engage with industry, governments, and the broader community. Universities can leverage social media platforms, online forums, and digital networks to connect with potential collaborators, industry partners, and alumni. This connectivity enables universities to stay tuned to the needs and trends of various sectors.

Hyper-connectivity has also spurred the emergence of online education, expanding access to learning opportunities beyond traditional campus settings. Universities now offer online courses, degree programs, and Massive Open Online Courses (MOOCs), providing flexible learning options for students worldwide. Hyper-connectivity has democratized education, breaking down barriers of time, location, and socio-economic status, and empowering lifelong learning.

However, along with the benefit, hyper-connectivity also brings challenges that universities must face. The need to ensure data security, privacy, and digital literacy skills become paramount in an interconnected world. Universities must adapt to changing technological landscapes, upgrade their infrastructure, and invest in digital capabilities to harness the potential of hyper-connectivity fully.

Hyper-connectivity has revolutionized the higher education landscape, transforming the way universities operate, collaborate, and disseminate knowledge. It has

connected students, researchers, and institutions globally, fostering collaboration, innovation, and cultural exchange. The seamless connectivity provided by hyper-connectivity has democratized education, expanding access to learning opportunities. As technology continues to advance, universities must embrace hyper-connectivity, adapt to the changing digital landscape, and leverage its potential to shape the future of education and make a positive impact on society.

So, the relationship between universities and the factors of technology, innovation, and hyper-connectivity demonstrates the dynamic and symbiotic nature between academia and the broader society. Universities play a vital role in driving technological advancements, fostering innovation, and embracing the opportunities presented by hyper-connectivity. They serve as hubs of knowledge, nurturing the next generation of professionals, and collaborating with industry partners. Furthermore, universities contribute to economic growth, address societal challenges, and promote global collaboration. While the university system has shown its adaptability and alignment with society's vision through its pursuit of excellence, entrepreneurial activities, and the democratization of education, ongoing efforts are necessary to ensure the continued alignment with societal needs, address challenges brought by technological advancements, and embrace the transformative potential of innovation and hyper-connectivity. By actively evolving and embracing these factors, the university system can continue to play a crucial role in shaping the future and making a positive impact on society.

Solow, Knowledge Economy, Fourth Industrial Revolution

We now investigate the relationship between the university system and the three models previously presented: The Solow Model, The Knowledge Economy Model, and the Fourth Industrial Revolution Model.

University&Solow Model

Universities play a crucial role in the Solow model, which emphasizes the accumulation of Human Capital as a fundamental input. Human capital represents the knowledge, skills, and abilities of individuals that contribute to their productivity. As a key provider of higher education, universities equip students with specialized knowledge and skills necessary for the workforce.

In the Solow Model, the variable e represents education and signifies the level of human capital in the economy. Universities contribute to increasing the level of education by offering a wide range of academic programs across disciplines such as science, technology, engineering, mathematics, social sciences, and humanities. Not

only do universities provide students with theoretical foundations, practical skills, and critical thinking through their curriculum, but they also enhance their productivity in the labor market.

Universities drive research and innovation, which are essential drivers of technological progress and economic growth in the Solow model. Research-intensive universities engage in cutting-edge research, generating new ideas, discoveries, and innovations. Collaborating with industries, government agencies, and other research institutions accelerate the translation of research findings into practical applications, resulting in economic growth.

Universities also play a critical role in fostering an entrepreneurial ecosystem by supporting the commercialization of ideas in the formation of start-ups. Many universities have established entrepreneurship programs, incubators, and technology transfer offices to provide aspiring entrepreneurs with mentorship, access to funding, and business development resources. By nurturing an environment that encourages innovation and entrepreneurship, universities make significant contributions to the creation of new industries, job opportunities, and economic growth.

The contribution of the university system to the Solow model also stands in promoting knowledge diffusion and global connectivity. Universities act as knowledge hubs, attracting students and scholars from diverse backgrounds and cultures, facilitating the exchange of ideas, experiences, and perspectives. Through research collaborations, joint projects, and academic conferences, universities enable the dissemination of knowledge on a global scale. This exchange of ideas and information not only enhances the diffusion of technology across countries, but also allows economies to benefit from advancements made in other parts of the world.

Universities are pivotal institutions for human capital accumulation, research and innovation, entrepreneurship support, and knowledge diffusion in the Solow model. Given their multifaceted contributions aligned with the key factors emphasized in the model, universities play an indispensable role in understanding and advancing economic growth dynamics.

University & Knowledge Economy Model

In the Knowledge Economy Model, universities hold a significant position as contributors to the creation, dissemination, and application of knowledge. They serve as centres of intellectual capital and play a crucial role in developing a highly educated and skilled workforce.

With the knowledge economy model, universities are the primary drivers of knowledge generation through their research and development activities. By conducting scientific investigations, producing academic publications, and pushing

advancements in various fields, universities enrich the knowledge base of society and stimulate innovation.

Furthermore, universities are instrumental in educating and training individuals, equipping them with the necessary skills and knowledge to thrive in the knowledge economy. They offer formal education programs, vocational training, and lifelong learning opportunities. By focusing on human capital development, universities ensure a competent and adaptable workforce that can meet the evolving demands of the economy.

Collaboration is a fundamental element of the knowledge economy model, and universities actively engage with businesses, government institutions, and other stakeholders. Through strategic partnership, universities facilitate knowledge transfer, expertise sharing, and innovation. These collaborative efforts contribute to the development of new products, services, and processes, promoting economic growth and competitiveness.

Transferring knowledge and technology from academia to industry is another vital role of universities. Technology transfer offices are established, patent licensing are engaged, start-up incubators are fostered, commercialization of research findings is enabled and new businesses are established more easily. This entrepreneurship ecosystem supports economic development and fosters innovation-driven enterprises.

Universities also contribute to the knowledge economy by cultivating an environment of continuous learning and intellectual curiosity. They encourage critical thinking, problem-solving, and creativity among students, preparing them for the complex challenges of the modern economy. Through research collaborations and academic conferences, universities facilitate the exchange of ideas, further advancing knowledge creation and dissemination.

We understand that universities are integral to the knowledge economy model by actively contributing to knowledge generation, providing education and training, supporting innovation and collaboration, facilitating technology transfer, and promoting lifelong learning. Their role in developing human capital, driving research and innovation, and establishing strong connections with various stakeholders makes them key drivers of economic growth and prosperity in the knowledge economy.

University&Fourth Industrial Revolution Model

Universities play a crucial role in the Fourth Industrial Revolution by driving technological advancements, fostering innovation, and preparing individuals for the changing landscape. They contribute to technological advancements by conducting research and development in key areas such as artificial intelligence, robotics, and

blockchain. Through collaborations with industry partners, universities push the boundaries of what is possible.

Innovation is essential in the FIR, and universities serve as hubs for innovation. They provide an environment where researchers, students, and industry partners collaborate to develop new products, services, and business models. Technology transfer offices and entrepreneurship programs within universities support the commercialization of research findings and the creation of startups that drive economic growth.

Collaboration is a key aspect of the FIR, and universities actively participate in collaborative efforts. They work with government and industry to address societal challenges, develop policies, and promote responsible and ethical use of emerging technologies. Collaborations between universities and industry partners drive innovation and technological advancements.

The future of work and education is being transformed by the FIR, and universities play a vital role in preparing individuals for this changing landscape. They need to adapt their curricula and educational programs to equip students with the technical skills related to emerging technologies, as well as essential soft skills such as critical thinking and collaboration. Universities also provide opportunities for lifelong learning, allowing individuals to continuously update their skills and adapt to evolving technologies and work environments.

The FIR is characterized by hyper-connectivity, facilitated by digital technologies, and universities leverage this connectivity to enhance collaboration, knowledge sharing, and access to information and resources. They utilize online platforms, digital tools, and virtual learning environments to deliver education and engage with students globally. Universities also contribute to the development and use of technologies that enable hyper-connectivity, such as advanced communication systems, cloud computing, and big data analytic.

Universities contribute significantly to the FIR by driving technological advancements, fostering innovation, collaborating with stakeholders, preparing individuals for the future of work and education, and leveraging hyper-connectivity and digital transformation. Their active involvement ensures that individuals and societies can navigate the opportunities and challenges presented by the FIR effectively.

Universities are integral to the Solow model, the Knowledge Economy model, and the Fourth Revolution model. Their contributions in human capital accumulation, research and innovation, entrepreneurship support, knowledge diffusion, and technological advancements make them key drivers of economic growth and prosperity in these models.

University system: the Italian Way

The Italian university system has a rich history and is known for its strong emphasis on academic excellence and research. It comprises a large number of universities - public and private - offering a wide range of academic disciplines and programs.

One notable aspect of the Italian university system is its *decentralized nature*. Universities in Italy enjoy a significant level of autonomy in decision-making processes, curriculum development, and research activities. This autonomy allows universities to tailor their programs and research directions to meet the specific needs of their students and regions.

Italy is home to several prestigious universities that are internationally recognized for their academic rigour and research output. Institutions such as the University of Bologna, Sapienza University of Rome, and Politecnico di Milano are among the top-ranked universities in Europe and attract students and scholars from around the world.

The Italian university system places a strong emphasis on research and innovation. Many universities have research centres and laboratories dedicated to various fields of study, including science, engineering, medicine, humanities, and social sciences, and they contribute to advancements in knowledge and promote collaborations with industries and other research institutions.

One distinctive feature of the Italian system is the presence of small and specialized universities known as *Politecnici*. These institutions focus on technical and engineering disciplines and are renowned for their expertise in areas such as architecture, design, and applied sciences. Politecnici offer specialized training and play a vital role in providing skilled professionals to industries.

In recent years, the university system has faced some challenges. Funding constraints have limited the resources available for research and infrastructure development. Additionally, there have been concerns about the efficiency and effectiveness of the system, including issues such as high drop-out rates and long completion times for degrees.

Efforts have been made to address these challenges and improve the system. Reforms have been implemented to enhance the quality of education, promote internationalization, and strengthen the connection between academia and industry. Initiatives such as the establishment of research consortia and the promotion of technology transfer have aimed to foster innovation and economic development.

The Italian university system also plays a significant role in promoting cultural and intellectual exchange. Italy has a long tradition of attracting international students through various exchange programs and scholarships. This diversity enriches the academic environment and contributes to a global perspective among students and scholars.

Italian universities operate within a structured framework that encompasses different levels of education, including bachelor's, master's, and doctoral degrees. Let's delve into the details of how Italian universities work.

The journey begins with the bachelor's degree, known as *Laurea Triennale*. This undergraduate program typically lasts three years and provides students with a solid foundation in their chosen field of study. During this period, students attend lectures, participate in seminars, and engage in independent study to acquire a broad understanding of their disciplines.

Upon completion of the bachelor's degree, students can pursue a master's degree - *Laurea Magistrale*. The program usually lasts two years and offers specialized knowledge and advanced coursework in a specific area of study. Students have the opportunity to deepen their expertise through research projects, internships, or practical training, depending on their chosen field.

Alternatively, a bachelor degree can be followed by a one-year master course, usually splitted in 6-months lectures and 6-months internship. The approach is more practical, and students are mainly evaluated on project works conducted in team and low-weighted exams.

For those aspiring to pursue further academic and research endeavours, Italian universities offer doctoral programs, known as *Dottorato di Ricerca*. Doctoral studies typically last three years and focus on original research under the guidance of a faculty advisor. Candidates are required to produce a doctoral thesis, making a significant contribution to their field of study.

The course structure is organized into academic credits known as *crediti formativi universitari* - CFU . Each course carries a specific number of CFU, reflecting its workload and the learning outcomes expected from students. The accumulation of CFU determines students' progression through their degree programs.

Throughout their studies, students are assessed through written and/or oral exams, projects, presentations, and the successful completion of internships or practical training. These assessments contribute to the final grade and the awarding of the degree.

Italian universities also prioritize internationalization and offer opportunities for students to study abroad through exchange programs, collaborations with foreign institutions, and participation in research projects or internships overseas. This global perspective enhances students' inter-cultural competence and broadens their horizons.

The Bologna Process, a European higher education reform initiative, has influenced the structure of Italian programs. It promoted the adoption of the European Credit Transfer and Accumulation System (ECTS), facilitating the recognition and mobility of credits across European universities. This encourages student mobility and promotes international collaboration.

Italian universities shape the academic and professional paths of countless students. The Italian university system follows a structured approach that combines lectures, exams, and independent study.

Throughout the academic year, which is typically divided into two semesters, students engage in various learning activities. They can choose to attend lectures and seminars where professors impart subject-specific knowledge. Lectures are conducted in large classrooms, while seminars provide a more interactive setting for discussions and practical exercises. These sessions are designed to provide students with a solid foundation in their chosen fields of study.

Course selection is a crucial part of university life in Italy. Students are typically given the opportunity to choose courses based on their interests and academic goals. These courses are often offered by their respective faculties or departments, allowing students to tailor their academic journey and create a personalized portfolio of subjects. By adding these elective courses to their mandatory subjects, students can shape their university experience and focus on specific areas of study that align with their career aspirations or intellectual curiosity.

In addition to attending lectures, independent study is a crucial component of the university experience. Students are provided with course materials such as syllabi, recommended textbooks, and additional readings. They are expected to engage in independent research, read academic literature, and undertake projects to deepen their understanding of the subject matter. This self-directed learning enables students to develop critical thinking skills and gain a comprehensive grasp of their chosen disciplines.

Assessment in Italian universities primarily takes the form of written and oral exams. These exams are typically scheduled at the end of each semester or academic year. Students must demonstrate their knowledge and understanding of the subjects by answering questions or presenting their work to professors or examination committees. Some courses may also include group projects or presentations as part of the assessment process.

The grading system in Italian universities ranges from 18 to 30, with 18 being the lowest passing grade. A mark of *30 cum laude*, indicating exceptional performance, is occasionally awarded to deserving students. This system provides a clear evaluation of students' academic achievements.

Many degree programs in Italy incorporate practical training and internships as part of the curriculum. These experiences offer students real-world exposure and the opportunity to apply their theoretical knowledge in professional settings. Practical training and internships contribute to students' professional development and enhance their employability upon graduation.

Italian universities are continuously evolving to meet the changing needs of students and society. With advancements in technology, many institutions are embracing blended learning approaches that combine traditional in-person lectures with online resources and activities. This provides students with greater flexibility and accessibility in their learning journey.

We now provide an analysis of pros and cons of the Italian university system. To do so, we conduct a SWOT analysis.



Figure 2: Italian University system - Strengths.
Created by Francesca Angusti using Canva.

The internal part of the analysis shows several **strengths** that contribute to its reputation and in the comparison with top-quality university systems worldwide.

A notable strength is the Italian rich *historical and cultural heritage*. Italy is renowned for its contributions to art, literature, philosophy, and science throughout history. This cultural backdrop provides a stimulating and inspiring environment for students and scholars, fostering a deep appreciation for knowledge and creativity.

Italian universities also excel in disciplines such as arts, design, fashion, and humanities. The country's long standing tradition of craftsmanship and artistic excellence is reflected in the exceptional quality of education and research in these areas. Italian universities provide students with unique opportunities to learn from industry experts, collaborate with renowned artists and designers, and engage in

hands-on experiences that enhance their practical skills. Getting educated from a *rooted-cultural country!*

The *close ties between Italian universities and various industries* offer students valuable opportunities for internships, practical training, and research collaborations. Italy is home to many successful and innovative companies across different sectors, providing students with access to real-world applications of their studies. This integration between academia and industry enhances students' employability and prepares them for the dynamic demands of the job market.

The Italian university system also boasts a *diverse and comprehensive range of academic programs*. From traditional disciplines to emerging fields, Italian universities offer a broad spectrum of courses and degrees at the undergraduate, graduate, and doctoral levels. This diversity allows students to pursue their specific interests and tailor their educational path to align with their career goals.

Another strength lies in the *quality of research produced by Italian universities*. Italian researchers have made significant contributions to various scientific fields, advancing knowledge and innovation globally. The country is home to numerous research centres and institutes that promote interdisciplinary collaboration and facilitate ground-breaking discoveries. The emphasis on research excellence enhances the academic environment and provides opportunities for students to engage in cutting-edge projects.

Italian universities also prioritize *internationalization and encourage mobility* among students and faculty. They actively participate in exchange programs, joint degrees, and research collaborations with institutions worldwide. This international outlook fosters cross-cultural understanding, exposes students to diverse perspectives, and promotes collaboration on a global scale.

The *vibrant student life and social activities* offered by Italian universities contribute to a well-rounded educational experience. Students have access to a range of extracurricular activities, clubs, and organizations that promote personal development, leadership skills, and community engagement. The lively and inclusive campus environments foster a sense of belonging and create lifelong connections among students.

Lastly, the Italian university system benefits from a *strong network of alumni* who have achieved success in various fields. Alumni play a vital role in mentoring current students, providing career guidance, and facilitating professional opportunities. This network strengthens the reputation and influence of Italian universities and contributes to a supportive and influential community.



Figure 3: Italian University system - Weaknesses.
Created by Francesca Angusti using Canva.

The other half of the internal analysis reveals the **weaknesses** of the university system in Italy.

The *limited funding and resources allocation* is one of the primary weaknesses of the Italian system. Despite the significant contributions made by universities, they often face financial constraints that can threaten the availability of state-of-the-art facilities, research funding, and student support services. Adequate investment in infrastructure, equipment, and research grants is essential to foster a thriving academic environment and attract top-tier faculty and students.

Another challenge lies in the *bureaucratic and chalky administrative processes* that can impede efficiency and innovation. Streamlining administrative procedures, reducing red tape, and fostering a more flexible and responsive framework could contribute to a more agile and dynamic university system. Simplifying administrative processes can free up time and resources for faculty and staff to focus on teaching, research, and student support.

The Italian university system also faces some criticism regarding the *level of competitiveness and meritocracy*. In some cases, there may be concerns about the transparency and fairness of admissions and evaluation processes. Enhancing transparency, merit-based selection criteria, and equal opportunities for all qualified students can promote a more equitable and competitive academic environment.

In terms of *internationalization*, while Italian universities actively participate in global collaborations, there is room for further improvement. Increasing the number of English-taught programs, expanding international exchange opportunities, expanding financial support and attracting more international

students and faculty can encourage greater diversity and global perspectives within the Italian university system.

The issue of *brain drain* poses a significant challenge as well. Talented researchers and academics often seek opportunities abroad due to better funding, career prospects, and research facilities. Encouraging and incentivizing talented individuals to remain within the Italian university system can help retain intellectual capital and foster a vibrant academic community.

Additionally, there is a need for *stronger connections between academia and industry*. While Italian universities have collaborative relationships with industries, further efforts can be made to bridge the gap between theoretical knowledge and practical applications. Strengthening industry partnerships, promoting entrepreneurship programs, and providing more internships and work-study opportunities can better align academic programs with the needs of the job market.

Lastly, a potential weakness lies in the *discrepancy among universities* in terms of resources, reputation, and rankings. Some Italian universities are globally recognized for their excellence, while others face challenges in maintaining high academic standards. Encouraging collaboration and knowledge-sharing among national universities, supporting underperforming institutions, and promoting a culture of continuous improvement can help elevate the overall quality of the Italian university system.



Figure 4: Italian University system - Opportunities.
Created by Francesca Angusti using Canva.

The second part of the SWOT analysis refers to an external exploration. Starting from the **opportunities**, we highlight the increasing *collaborations and research institutions worldwide*, Italian universities can enhance their global visibility and create opportunities for joint research projects, faculty exchange,

cultural diversity, and cross-disciplinary research, contributing to the advancement of scientific discoveries and academic excellence.

Another opportunity is to push in the *promotion of research and innovation*. Investing in research infrastructure, attracting top-tier researchers, and fostering a supportive ecosystem for innovation can lead to breakthrough discoveries, technological advancements, and intellectual property creation. By leveraging their expertise and resources, Italian universities can contribute to cutting-edge research areas, address societal challenges, and attract funding from national and international sources. This is an endless opportunity that won't ever be fully exploited.

The *digital transformation* presents a promising opportunity for Italian universities. Embracing technology in teaching and learning, research, and administrative processes can enhance efficiency, expand access to education, and facilitate interdisciplinary collaboration. By adopting innovative digital tools, online learning platforms, and virtual research environments, Italian universities can offer flexible and high-quality educational experiences, promote lifelong learning, and foster a culture of digital innovation.

Strengthening ties between academia and industry is another significant opportunity. By supporting collaborations with private enterprises, government agencies, and non-profit organizations, Italian universities can promote knowledge transfer, industry-driven research, and the development of practical skills among students. Partnerships with industry can lead to internship opportunities, applied research projects, and the creation of entrepreneurship programs that nurture innovative startups and contribute to regional and national economic growth.

Internationalization is a key opportunity for Italian universities to attract talented students and faculty from around the world. By expanding the availability of English-taught programs, providing support services for international students, and offering scholarships and grants, Italian universities can create a welcoming and inclusive environment for students from diverse backgrounds. Enhancing the internationalization efforts can lead to cultural exchanges, increased diversity, and the enrichment of the academic community.

Furthermore, promoting *interdisciplinary studies and research* is an opportunity for Italian universities to address complex societal challenges. By breaking down traditional disciplinary boundaries and encouraging collaboration across different fields, universities can create a fertile ground for interdisciplinary research, critical thinking, and creative problem-solving. Interdisciplinary programs can equip graduates with the skills needed to tackle emerging global issues and contribute to sustainable development.



Figure 5: Italian University system - Threats.
Created by Francesca Angusti using Canva.

The last point to analyse in the SWOT analysis refers to the **threats** the university system experiences.

The main one is the *limited financial resources* that limit investments in research infrastructures, faculty recruitment, student support services, and the overall quality of education. In a highly competitive global landscape, inadequate funding may impede the ability of Italian universities to attract and retain top talent, conduct cutting-edge research, and provide a conducive learning environment.

This is linked to the emigration of highly skilled academics and researchers that may be attracted to opportunities in countries with better systems. *Brain drain* can result in a loss of intellectual capital, reduced research output, and a decline in the overall quality of education and innovation.

Another threat is linked to the *excessive bureaucracy and rigid academic* structures that can get in the way of innovation and agility. Cumbersome administrative processes, slow decision-making, and limited autonomy can slow down the ability to respond quickly to changing educational and research needs. This can stifle creativity, not properly support interdisciplinary collaboration, and limit the responsiveness to emerging trends and demands in the global academic landscape.

The lack of *English-taught programs* is not only a weakness of the system, but it turns into a threat too. In fact, students, especially talented ones, could opt to search for the perfect course abroad, with the side effect of reducing cultural diversity, missing opportunities for knowledge exchange and global partnerships.

Also the *weak industry engagement* in some cases can bring students to look for alternatives. Without strong ties to some industry, universities may struggle to

address real-world challenges, provide students with practical skills, and ensure the relevance of their programs to the needs of the job market. Not only the tidiness, but even the quality and the availability represent a threat.

All those threats contain the main one: *competition from top-tier universities*. The global higher education landscape is highly competitive, with many top-tier universities vying for talent, research funding, and international recognition.



Figure 6: Italian University system - SWOT analysis.
Created by Francesca Angusti using Canva.

Overall, the analysis includes many repetitions. This is because the Italian university system has some characteristics (strengths and weaknesses) that, if properly exploited and managed, can bring significant opportunities, otherwise the system can incur several threats that undermine the entire system. Strengths and weaknesses presented, in fact, aren't top quilted. This means that there is a margin of improvement. It only depends on the way the Italian system decides to face them.

University System Worldwide

The university system worldwide is highly diverse and it encompasses a wide range of approaches, structures and quality levels.

For this part of the analysis we are taking the top-quality universities as a benchmark.

From THE World University Ranking, the variables to take into consideration when assessing for quality are:

- **Teaching:** based on factors like student-to-faculty ratios, faculty qualifications and expertise, satisfaction, teaching resources [...];
- **-Research:** based on research output, impact and reputation;
- **Citations:** it defines the influence and the impact the university has;
- **Industry income:** represents the impact of the university in economy and society;
- **International outlook:** the ability to attract international students.

But we also add:

- **Institutional control:** governance and management structure, as well as autonomy and academic freedom;
- **Endowment fundings:** access to financial resources;
- **Quality of students and faculty:** caliber of students, qualifications and expertise;
- **Medical school**¹²: its presence increases the quality perception.

To better understand the system worldwide, we conduct a SWOT analysis on top-quality universities worldwide.



Figure 7: University system Worldwide - Strengths.
Created by Francesca Angusti using Canva.

Identify the **strengths** of top-quality system is easy. *Academic excellence* lies at the core of these universities, thanks to their curricula, their wide range of disciplines and their high educational standards. They cultivate intellectual curiosity and critical thinking, and prepare their students for future challenges.

Also *research* is a cornerstone in defining them on top. It drives innovation and pushes the boundaries of knowledge.

¹² Beyond Boundaries. Characteristics of highly ranked in the Times Higher Education (THE) World University Rankings. Retrieved from <https://vtechworks.lib.vt.edu/bitstream/handle/10919/79640/BBcharacteristics-of-top-the-universities.pdf?sequence=1&isAllowed=y>

Worldwide reputation is the indicator to their exceptional standing in the academic world. They are internationally recognized for their excellence in teaching, research and innovation. They attract talented students from all over the world, fostering a diverse and vibrant academic community.

They support cutting-edge research, experimental learning and a dynamic academic environment. They have *well-equipped spaces* for all kind of students in any field, providing the necessary resources for their intellectual pursuits.

The *student Body* is characterized by talent and diversity. The brightest minds are attracted into these institutions, co-creating a stimulating and collaborative learning environment.

Alumni network is another strength. Graduates positively contribute to society, upholding their reputation in the alma mater. They also provide mentorship and career support.

Partnerships between university and industries are also relevant. Partnerships are essentials for internships, education programs and research initiatives. This can also lead to *interdisciplinary*, promoting and integrative approach.

Another important point refers to *internationalization*. Global engagement and cross-cultural understanding is vital in promoting a diversified approach, preparing students for the globalized world.

Lastly, the *impact on society*. Universities are institutions that contribute to economic development, social challenges, community engagement and outreach programs.



Figure 8: University system Worldwide - Weaknesses.
Created by Francesca Angusti using Canva.

Top-quality universities also face some **weaknesses**. We now see only the common ones.

The main is related to *high costs of education*. Many high ranked universities are inaccessible for many deserving students. Tuition fees and expenses can limit its access, potentially excluding talented students from underprivileged backgrounds.

Despite of this, *competition* for admission is high. The number of applications is significant, sharpening the selective admission process, and increasing pressure on students.

Sometimes this can lead to an increase in *students population*, resulting in overcrowded classrooms with limited interactions. This undervalue the personal learning experience and support.

The *focus on quality* can blurred other important aspects, not giving them the right attention and focus.

Also *internationalization* could be challenging. Despite the access to it, it could be difficult sometimes to organize it properly and to offer everyone the same opportunities.

If the university grows in size and complexity, also the *bureaucratic system*. This could slow down processes, impacting negatively.

Lastly, *tradition-innovation balance*. Innovation is a driver, but don't forget about the history and vice versa.

For the external analysis of the SWOT , were pointing out some previous points already discussed, but with a slightly different focus.



Figure 9: University system Worldwide - Opportunities.
Created by Francesca Angusti using Canva.

Opportunities can shape university system future, allowing it to continue growing.

Undoubtely, *technological advancements* have the potential to revolutionize the way education is delivered, increasing its accessibility, interaction and flexibility. It opens doors for far away students, as well as global research and collaborations, resulting in a powerful core aspect for the system itself.

This can lead to a further increase in *globalization and internationalization*, that bring cross-cultural understanding and influence. In this way, universities shape students perspective to be global and interconnected.

It is also linked to *interdisciplinary*. By breaking down traditional boundaries, not only cultural, but even across fields, it builds a multidisciplinary approach able to face complex challenges.

The opportunity to keep looking for *partnerships* can enforce the bridge between university and job world, creating an easier path for students to access it. Even a more concrete alignment between university programs and industry needs can positively support students skills and knowledge.

Again, *social impact* opportunity is an evergreen. Today it's a strength, but is can also be considered as an opportunity for future challenges.

The last point of the analysis refers to threats, that can potentially lead to negatively impact on effectiveness, reputation and long-term sustainability.



Figure 10: University system Worldwide - Threats.
Created by Francesca Angusti using Canva.

The main of them is the threat of an increment in *costs*, *limiting the access* to the academia, and potentially *denying* the access to talented students.

Due to the hunger for fame, education could be commercialized, with the main focus of generating revenue, instead of the academic excellence and knowledge creation.

Also *technological advancements* represent a threat, doubting about quality and credibility of the information. The increasing use of technology could also affect social interactions.

Global competition among universities is a persistent threat, based on rankings, prestige, research funding and partnerships. This can lead to a prioritization of short-term gains instead of long-term ones.

Lastly, facing *societal and demographic changes* can be challenging for university systems that are required to quickly and effectively adapt to them.



Figure 11: University system Worldwide - SWOT Analysis.
Created by Francesca Angusti using Canva.

Also for the worldwide system, it seems that the future will depend on how we decide to face it. Even in this analysis, points are repeated and discussed under different perspectives, necessary to give an overall indication of how things could be.

Generally, the future seems to be bright. In the past we've already faced many opportunities and threats mentioned, and the overall outcome was positive. For this reason, despite what we are going to face in the future, there is a high probability of an effective answer and reaction to possible obstacles on the path.

University System in figures

On the MIUR¹³ official website, there is the list of all universities in the country - 98¹⁴ - and the number of enrolled students - 1.822.141¹⁵ - splitted in:

Laurea Triennale	1.126.003 ¹⁶
Laurea Magistrale	393.525
Laurea Magistrale a ciclo unico ¹⁷	293.545

A national statistic¹⁸ shows the following rank of Italian universities:

University	Global Score
1. University of Padua	68.9
2. University of Bologna	68.3
3. Sapienza University Rome	68.0
4. University of Milan	65.9
5. University of Naples Federico II	63.7

With Ca' Foscari University in 53rd position, with a global score of 38.3.

A global ranking, instead, positions the University of Padua as 230th¹⁹, and Ca' Foscari as 544th. It seems that the path to a good competitive position is still long.

Italian education is perceived as good, but it can't compete with other big giants of the university landscape. We still have a lot to learn and improve.

¹³ Ministero dell'Università e della Ricerca. Retrieved from <http://ustat.miur.it/>

¹⁴ Ministero dell'Università e della Ricerca. Retrieved from <http://ustat.miur.it/>

¹⁵ Ministero dell'Università e della Ricerca. Retrieved from <http://ustat.miur.it/>

¹⁶ Ministero dell'Università e della Ricerca. Retrieved from <http://ustat.miur.it/>

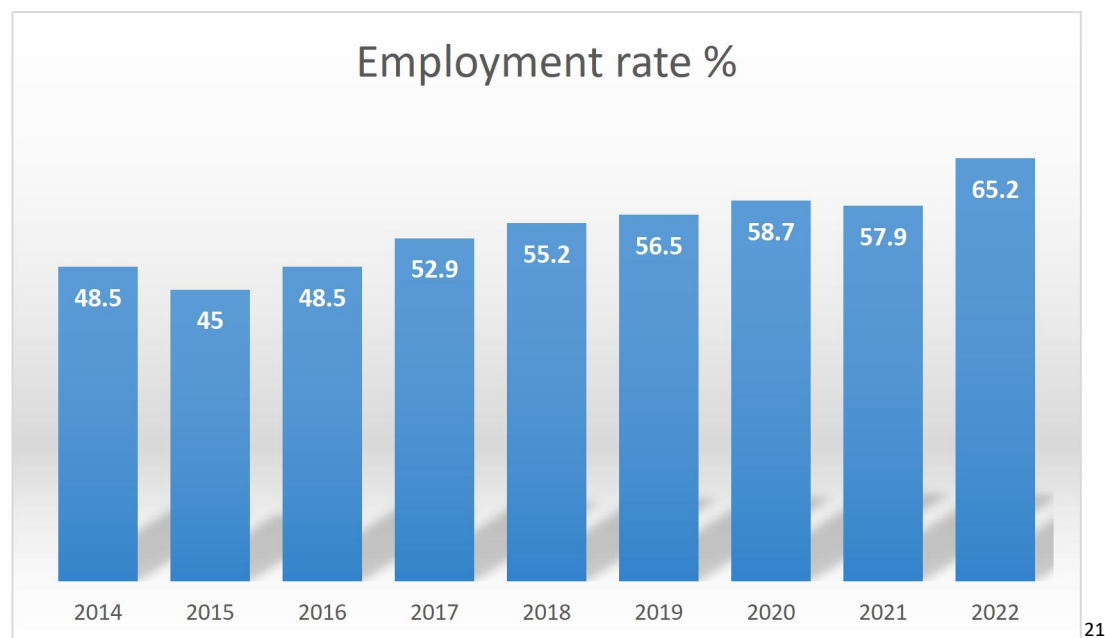
¹⁷ It means a full course of 5+ years with no intermediate graduation (example, medicine, law, architecture...)

¹⁸ Best Global Universities in Italy. U.S. News. Retrieved from <https://www.usnews.com/education/best-global-universities/italy>

¹⁹ Round University Rankings. Round University Rankings. Retrieved from <https://roundranking.com/ranking/world-university-rankings.html#world-2022>

Let's have a look to the employment rate of early graduates in Italy. Current EUROSTAT rate for 2022 is 65.20%²⁰. A significant increase with respect to the previous years, but still a weak rank for European competition.

The following graph shows Italian employment rates from 2014 till 2022.



21

But, no matter the improvements, Italy remains the rear of Europe. Here, 2022 data²².

Country	Last %	Previous %
Netherlands	92,90	93,40
Germany	92,20	91,20
Malta	90,80	89,00
Austria	88,40	87,70
Sweden	88,10	87,20
Ireland	87,20	86,20
Denmark	85,10	84,30
Slovenia	84,20	85,10
Finland	83,90	81,50
Lithuania	83,40	79,90
Belgium	82,90	83,20
Czech Republic	82,20	84,20
Portugal	81,70	76,10

²⁰ Trading Economics. (n.d.). Italy - Employment rate of recent graduates. Retrieved from <https://tradingeconomics.com/italy/employment-rates-of-recent-graduates-eurostat-data.html>

²¹ Trading Economics. (n.d.). Italy - Employment rate of recent graduates. Retrieved from <https://tradingeconomics.com/italy/employment-rates-of-recent-graduates-eurostat-data.html>

²² Trading Economics. (n.d.). Italy - Employment rate of recent graduates. Retrieved from <https://tradingeconomics.com/italy/employment-rates-of-recent-graduates-eurostat-data.html>

Cyprus	81,40	80,40
Euro Area	76,60	77,50
Spain	79,10	72,80
Bulgaria	78,80	73,80
France	78,60	78,10
Estonia	77,40	80,80
Romania	69,90	70,10
Greece	66,10	60,10
Italy	65,20	57,90

We may start wondering why? What do we miss?

For this reason, it's appropriate to refer our analysis to the worldwide university system.

Let's start from some data²³ evidence:

University	Location	Global Score
Harvard University	US	100,00
Massachusetts Institute of Technology (MIT)	US	97,7
Stanford University	US	95,2
University of California Berkeley	US	88,7
University of Oxford	UK	86,8

The gap with the top ranked Italian university is big and significant. The reason why stands in the ability of those universities to identify innovation and foster it, being ready to change their way-of-doing to pursuit a better aim: keep up with the times.

²³U.S. News. Best Global Universities Rankings. Retrieved from <https://www.usnews.com/education/best-global-universities/rankings>

Now, we present employment rates of top-ranked universities:

University	Employment rate %
Harvard University	96% ²⁴
Massachusetts Institute of Technology (MIT)	79,3% ²⁵
Stanford University	94% ²⁶
University of California Berkeley	96,1% ²⁷
University of Oxford	80% ²⁸

The data presented shows the backlog position of Italy, both compared to Europe and to the world.

Italian low European position in employment rates underlies some issues the system is incurring that need to be addressed. The Italian system should be inspired by the top-quality one to enhance employment prospects, prioritize innovation, adaptability and a forward-looking approach.

Also, addressing the challenges faced by Italian universities requires a comprehensive effort from the government. Educational institutions and other stakeholders. By investing in research, shaping a culture of innovation, and strengthening the relationship between universities and the job market, Italy can work towards bridging the gap and ensuring a brighter future for its graduates.

We're still on time.

²⁴ Harvard University. Graduate Employment Outcomes. Retrieved from <https://www.hsph.harvard.edu/career-services/graduate-employment-outcomes/>

²⁵ Massachusetts Institute of Technology. (2021, September 27). QS rates MIT #1 for employability. Retrieved from <https://capd.mit.edu/blog/2021/09/27/qs-rates-mit-1-employability/>

²⁶ Stanford University. Outcomes. Retrieved from <https://ed.stanford.edu/careers/outcomes>

²⁷ Law School Transparency. Berkeley Law: Jobs. Retrieved from <https://www.lawschooltransparency.com/schools/berkeley/jobs>

²⁸ University of Oxford. Careers and Alumni. Retrieved from <https://www.ox.ac.uk/admissions/graduate/student-life/careers-and-alumni>

Appendix 1

In the following appendix, we're going to present some interesting answers to a survey we've conducted. The survey aim is to investigate education abroad.

The survey is introduced by some general questions - study course, university, country and city. Instead, the second part gets insights on different universities worldwide, going more in depth into pros and cons, what could be done better, and the relationship with new technologies and AI.

The following questions and answers are the most relevant ones, in our opinion.

Automotive Engineering and Motorsport Technology, at Blackpool & Fylde College
Blackpool, UK

What are the pros of your university/course?

The tutors are *industry-experienced*, I'm familiar with the layout, good resources, good support system, 1-1 feedback compared to a traditional uni lecture.

What are the cons of your university/course?

Lack of *practical/hands-on modules*, modules were very "here is an assignment work on this until deadline"- focused which removes excitement and engagement in class. Some lessons could've been delivered better. No extra-curricular activities to gain insight from.

What would you change? How?

I personally would "*refresh*" the modules, not change them, but enhance them, in terms of academic approach and also experiencing industry standards, in real time, i.e go on a field trip. Create a fun second semester with practical modules to gain experience for the real world. The delivery of lessons should be concise and engaging to the audience, rather than showing us a Youtube video. Be more supportive for creating a network of students who would like to start out jobs in the industry. Our careers teams is underwhelming.

*What is the relationship between your university and technological advancements?
Argument it.*

Our college/university is *always investing in new technology*, as someone who is studying in the Automotive field, there is a shift for technicians being equipped with knowledge to service/repair HEV/-EV vehicles so we need to keep up with industry standards. This is also applied to combustion engines as well, using the appropriate software diagnostic equipment, rather than guessing what the problem could be, using the internet as resource to find help.

Politics, at King's College London

London, UK

What are the pros of your university/course?

My school is very *international* so getting a lot of different perspectives on global politics is very interesting. The university itself has lots of great study spaces and really good professors.

What are the cons of your university/course?

It is quite a *self taught course* with half of our class time going over readings we had done at home (I'm from the US so this is a very different teaching style), and the university itself could handle exams a lot better. Some of the courses had online exams while others didn't which feels quite unfair.

What would you change? How?

I would have our university provide *more clear guidelines* regarding examination policy for each professor to structure their exam accordingly.

What is the relationship between your university and technological advancements?

Argument it.

Our school is *quite good* with technological advancements, everything is on the learning software KEATS and the online library is really great.

BA (Hons) Primary Education with QTS, at Manchester Metropolitan University

Manchester, UK

What are the pros of your university/course?

- Support from lecturers;
- Experience based (placements);
- Research project;
- Resources from the library are easily available;
- The course prepares me for teaching;
- Range of resources to support me while on placement;
- Assignments allow me to choose topics to develop my understanding in particular topics;
- Financial support for students;
- Employment support with CV's, personal statement, interview practice;
- Guest speakers from the industry;
- Seminars that are subject specific to develop specific skills;
- Student support services;
- Student union;
- Protecting rights, guidance on issues in/out of university;
- Academic services e.g. resources, videos and appointments with library staff to develop writing and referencing etc.

What are the cons of your university/course?

The course is very intense with a lot of different elements which can be hard for me to *manage workload*.

What would you change? How?

I would provide more opportunities for students to *have a say* in the timings of assignments and lectures e.g. so that two units don't clash with placement. This could reduce the pressure for me to complete work. I would change certain practices in university e.g. more feedback from assessments, from tutors who can also give you the skills directly to improve.

*What is the relationship between your university and technological advancements?
Argument it.*

The university has a vast database of academic literature and sources which are digitized for pupils to use. This database is easily accessible and we have access to resources from a range of disciplines. There is a Moodle page which is a interface for students to access their units/modules and this can help manage work, readings, deadlines/assessments. In terms of reference management, we are trained in using different software such as Mendeley to be more efficient in organising literature and this has helped me in my dissertation to know where everything is. Also, I have used other software provided by the university called Nvivo which has been helpful in coding my data from transcripts in primary research. In addition, Microsoft Teams has made it easier for me to communicate with tutors and arrange meetings, organise my calendar, collect data for my dissertation which would have been difficult due to the geographical location of my participants. During my placement Microsoft One Drive has been crucial in data storage and helped me to organise my documents and teaching materials. One Drive has allowed me to collaborate on projects/assignments with my peers and made working more efficient.

Law, University of Bucharest

Bucharest, Romania

What are the pros of your university/course?

Applicability of the information and the large area of professions provided by the major.

What are the cons of your university/course?

Sometimes it's pretty hard to pass if you don't know the information by heart, rather than understanding it.

What would you change? How?

I would change the importance offered to some courses that are complementary to the main courses and are also hard to pass, because out attention should be on the courses that are included or even just related to the licence exam

*What is the relationship between your university and technological advancements?
Argument it.*

My university it's not very upgraded in the field of technological advancements. We use some legal database and our university pays the lunar fee for the access to that, but that's all.

Is it good to use AI in education? Why?

I think AI would provide some starter informations if you use it, but I don't think it's good to use it in the humanitarian fields such as law or linguistics, because it needs improvements concerning the capacity of critical thinking and case interpretation, and mainly it lacks creativity. In the STEM fields I think it's a pretty safe source for problem solving or key theoretical ideas.

History, Liverpool Hope University

Liverpool, UK

Is it good to use AI in education? Why?

I don't believe that AI in its current state is safe and good enough for education. I think with better advancements and restrictions on its use, it can be a good tool for students.

Economic and business administration, Babes Bolyai University of Cluj-Napoca

Cluj-Napoca, Romania

What would you change? How?

In my opinion they should *invest more into students* by offering more budgeted places and scholarships.

*What is the relationship between your university and technological advancements?
Argument it.*

My university is in continuous development when it comes about technological advancements, one of the latest investments being the smart screens to work on in every class.

Is it good to use AI in education? Why?

It is definitely a very helpful tool but only used carefully and responsible cause what it s the point to use AI in education if it does all the work.

Cyber Security, The University of The West of Scotland

Glasgow, Scotland

What are the cons of your university/course?

Lack of communication from lecturers and disorganisation.

What would you change? How?

Improve communication with students especially during online learning.

Civil Engineering, Pontificia Universidad Católica del Perú

Lima, Perú

What are the pros of your university/course?

Great engineering teacher staff and up-to-date laboratories and recognition in the countries enrolled in the Washington Accord.

What are the cons of your university/course?

It's 5 years for a Bachelor degree with the same content or level

What would you change? How?

More global exposition .

Is it good to use AI in education? Why?

As in everything in technology, AI has a great potential to be of good use be it in education or work. The thing is to find how to make the best use of it, it's not a "problem solver and I don't do anything else", it has to be used as a tool not as an already given answer.

Law, Universidad Catolica Argentina

Buenos Aires, Argentina

What are the pros of your university/course?

It's organized in smaller groups so the relation with the professors helps a lot to understand the subjects. Also, you need to read for almost all classes and participation is expected, so you learn every week instead of just studying all together for the final examination. also the location and the facilities are beautiful.

What are the cons of your university/course?

there are no virtual classes after the pandemic finished and i quite liked them.

What would you change? How?

I would use the smart blackboards to have both virtual and in presence classes at the same time for students to choose.

Is it good to use AI in education? Why?

Yes! i think its a very good learning tool and professors should learn how to exploit in the students best interest.

Law, Università degli studi di Milano

Milano, Italy

What would you change? How?

Introducing mandatory internship and practical courses, reducing the learning/organizing obstacles from the university career.

*What is the relationship between your university and technological advancements?
Argument it.*

We have some courses about it but little use of it, just for power point, presentation, administration and no more for online classes .

Pedagogy, Universidad Panamericana

Mexico City, Mexico

What are the pros of your university/course?

Personalised education, interaction with teachers .

What are the cons of your university/course?

Expensive degree, the degree is not well payed in the world we live in.

What would you change? How?

Giving more serious and practical examples of real life problems, example. How to act on bullying not just learning theory.

*What is the relationship between your university and technological advancements?
Argument it.*

They tried to teach us how to program with a very prepared teacher, they have advanced technology but only if you want to use it.

Is it good to use AI in education? Why?

Yes, we have the power to use technology as a tool and not as something "bad".
Once we do that it can help us with our struggles for example it can help someone with ADHD find information easier by "talking" and not the traditional way of searching for information.

Automotive engineering, Lancaster University

Blackpool, UK

Is it good to use AI in education? Why?

Yes and it helps save more time and focus more in learning new skills and information to build up more you're performance during the course.

Bachelor's of the Arts, Ohio Wesleyan University

Delaware, Ohio, USA

What is the relationship between your university and technological advancements?

Argument it.

They bought an electron microscope for \$500000. The science building is by far the nicest and most advanced building in campus.

Is it good to use AI in education? Why?

Using AI to write papers is wrong, however, there are definitely ways that it can be useful. It's a faster and better version of Google, you have the knowledge of the entire world at your fingertips.

Business and administration, University of Ghent

Ghent, Belgium

What are the pros of your university/course?

There were a lot of interactions moments with teachers and also between students. Each exams course was divided in two parts, the first one was a written part and the second one an oral part. So you had the opportunity to put into practice what you studied .

What is the relationship between your university and technological advancements?

Argument it.

Similar to the Italian one. They used some programs during classes but I think they could be a little bit more updated.

Is it good to use AI in education? Why?

Honestly I don't think so. AI can help many people in many sectors but if you abuse it, you may not learn many things well and in the long run it could be detrimental to adolescent learning.

Mediazione linguistica e culturale, University of Milan Statale

Milan, Italy

What is the relationship between your university and technological advancements?

Argument it.

Inexistent.

Business administration, University of Tampere

Tampere, Finland

What are the pros of your university/course?

It is very open and internationally oriented.

What are the cons of your university/course?

Sometimes there might be communication shortcomings.

What is the relationship between your university and technological advancements?

Argument it.

Tampere Uni is very technologically developed and it uses tools like visors or virtual reality during the courses.

European studies, Maastricht University

Maastricht, Netherlands

What are the pros of your university/course?

Multidisciplinarity.

What are the cons of your university/course?

Lack of specialisation options.

What is the relationship between your university and technological advancements?

Argument it.

My university is very good at being up to date when it comes to technology. We have very good university wide platforms. More classes focuses on technologies would be nice.

International Business Administration, University of Twente

Enschede , The Netherlands

What are the cons of your university/course?

It is not necessarily targeted by recruiters of the companies I want to work for

What is the relationship between your university and technological advancements?

Argument it.

Very good. My university is known for their technological innovations. A lot of tech startups arise from University.

Political science, Uni Mannheim

Mannheim, Germany

What are the pros of your university/course?

High quality, possibilities to specialise.

What are the cons of your university/course?

Quite strict organised.

What would you change? How?

More diverse course and exam formats.

Reproductive Biotechnologies, Università degli Studi di Teramo

Teramo, Italy

What are the pros of your university/course?

It is a very specific course and the job opportunity should be high. The number of lab hour is the 50% of total. The university is small, which sometimes makes bureaucratic relationship easier.

What are the cons of your university/course?

The low number of professor who have graduated or operate in this field.

What is the relationship between your university and technological advancements?

Argument it.

The university is quite young and innovative in general, most of the equipments in the lab are new and technologically advanced. However, in classroom computer or computer access are not always available and some professor are strictly close-minded regarding the use of tools like online class or registration.

Is it good to use AI in education? Why?

No, it does not stimulates thinking. It could be good to use AI only in higher form of education, like university, where people should already have developed a good way to study or a critical thinking which would allow to understand how to "filtrate" informations provided by AI.

International Business and Management, Università degli studi di Pavia

Pavia, Italy

What are the pros of your university/course?

International Format, International people and a lot of contact with teachers.

What are the cons of your university/course?

Too much Theory.

What would you change? How?

I want to do more practical activities, maybe through the contact with the enterprises.

What is the relationship between your university and technological advancements?

Argument it.

It is not a lot, we talk a lot about technological advancement, especially as regards tools for facilitating work, but often we do not use the skills learned.

Is it good to use AI in education? Why?

on the one hand it can make work easier, on the other hand I can't define a limit within which AI can put our brains to sleep.

PhD in business, University of Teramo

Teramo, Italy

What are the cons of your university/course?

Everything, tutors don't help, no one knows English, everything is hard to do like if you want to contact with someone in administration you have to wait for their reply 2 weeks maybe or more.

What would you change? How?

Firstly I change system, one of these recommend will be know English, then work in working hours, help students for everything including learning process.

Appendix 2

The original topic of this dissertation was different. The idea was to solve a common problem: the access to textbooks. The focus was on the Italian market.

We started from some evidences: textbooks are expensive and Italy experiences a huge black market based on academic books. 2021 data report that the 35% of the Italian population has committed books piracy at least once in its life and the 81% of them are academic students. Losses are significant, with €243 million less for physical book shops, €455 million for online shops and €73 million in revenues for online tools - such as audio-books and e-books, for a total annual loss of €1.88 billion.

The problem is real and significant.

Let's start by investigating why students commit piracy.

From the student experience, it is very common to be asked to buy "that" specific book in order to pass the exam. Notes and lectures are not enough for an 18, online resources either. It seems that only the title suggested is the key to succeed in exams. It's also quite common to be surprised the day of the purchase by the name of the lecturer as author or co-author of the manual. Plus, it's also common to "need" more than a book for that specific subject. Considering that every semester is made up of at least three exams, and that academic books are quite expensive, the overall amount is quite heavy on students' pockets. Plus, it is also common to be asked not to study the whole book, but just a part of it. In this way, the effort is perceived to be even bigger, because the amount paid doesn't reflect the effect use of it.

The turnover of subject books is also high. That means that if the university has just adopted a book at your entering year, the demand for it is probably high by the time you pass the exam. Otherwise, the book will be quickly dismissed. So, the quickness of change is also relevant. In addition, society pushes students to be on time.

Attend classes, follow lecturer instructions, buy books legally, make an economic effort to satisfy every request, pass your exams, be on time.

Now, it should be easy to understand why students look for short-cuts, for example re-selling their books illegally to re-gain partially what they have spent for previous subjects and to afford upcoming ones, or obtain books by illegally downloading them or buying them from a copy shop.

It's important to highlight that the majority of copy shops do not respect the governmental limit rule of printing a 15% maximum of the entire book. The Italian affair is even more serious!

An Italian article from March 11th, 2022, presents a more criminal situation. Translating from the Italian:

“Illegal copies are mainly kept in the digital format, in PCs and hard disks. The hard disk is often connected to the current through a WiFi switch that can be deactivated remotely if necessary, in order to make it disappear from the network in case of checks”²⁹.

And about pricing, we know that:

“ [students] put money together, then they buy a copy and print it for everyone. Others borrow the book from the university library and go straight to the copy shop. On average, the price of a printed volume is 1/3 of the price of the whole book”³⁰. This is an overview of the reality in Italy.

We don't want to justify students, we just want to provide their point of view that, added to a general situation that seems to promote illegality above legality, it becomes the perfect scenario for overpassing rules and laws.

On the other hand, an author/publishing house can suffer from the non-gain on those books. In Italy, the remunerative system for authors recognizes them a variable percentage between 5% and 10% of the overall cost of the book, known as royalty. So, if the book is purchased at €10, the author will earn an amount between €0,50 and €1,00, depending on its royalty. The remaining part is split among editor, book seller, and distributor like this:

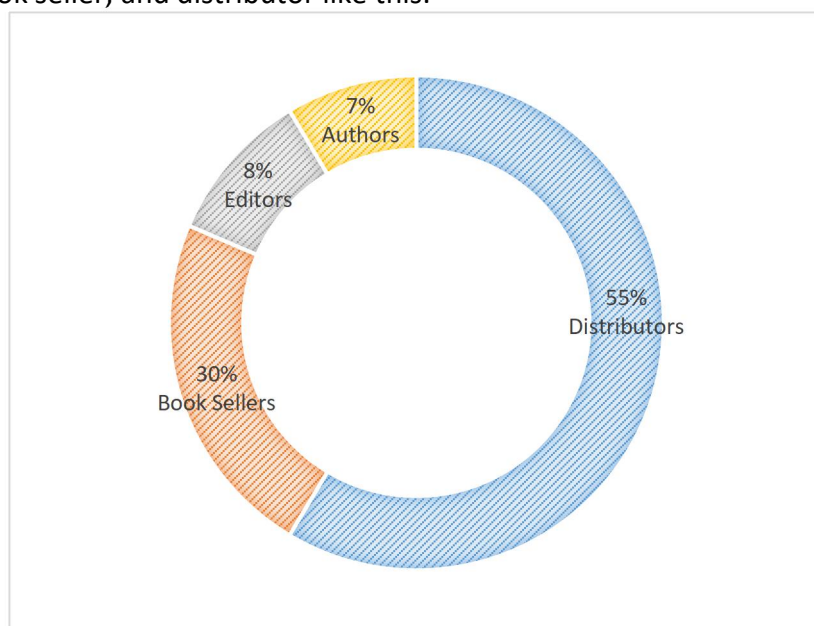


Figure 12: Book price splitting.
Created by Francesca Angusti using Word.

Is there a halfway to make both parties happy?

²⁹ Perugia Today. (n.d.). Fotocopie illegali, il mercato non si ferma: libri occultati negli hard disk disattivabili con un radiocomando o nei cd consegnati con i corrieri. Retrieved from <https://www.perugiatoday.it/cronaca/fotocopie-illegali-mercato-in-espansione-perugia.html>

³⁰ Perugia Today. (n.d.). Fotocopie illegali, il mercato non si ferma: libri occultati negli hard disk disattivabili con un radiocomando o nei cd consegnati con i corrieri. Retrieved from <https://www.perugiatoday.it/cronaca/fotocopie-illegali-mercato-in-espansione-perugia.html>

This is our win-win zone idea, called *UniProof*.

UniProof is a digital space where students and authors (and book providers in general) meet.

It born from the current situation of students avoiding legal books because of the high costs, and because of a lack in balance between study load and book price. This, brings students to opt for the optimal choice for them - not ethically-based - with the side effect of diminishing book providers' profit. In fact, by opting for illegal sources, property rights aren't recognized, and income isn't generated.

UniProof's aim is the one to create a space where students can obtain study material legally and at an accessible price, as well as recognizing book providers their property rights.

Book providers upload their books on the platform. UniProof format it so that students can select the parts they need. By subscribing, students select the subscription category that suit them the best. Thanks to the system implemented, both can benefit from it. Let's see it more in details.



Figure 13: UniProof tools.
Created by Francesca Angusti using Canva.

The **Image 1** presents all the tools offered by the platform. The main task refers to books. Student have access to a vast library, depending on the subscription they've signed.

Doodle me is a high-quality note section. It allows students to create their notes - in class and at home - as well as doodling the book. This section is intuitive and easy to use.

Count on me is a scientific calculator that helps students who are struggling with their maths issues. It also provides all the steps necessary to achieve the correct result.

Date me is an easy-to-use calendar, able to connect to the university website and email, and scheduling all your meetings and events. It could be used both manually or automatically.

Like Dante is a vocabulary-integrated. It can provide for meanings, as well as translations and synonyms and antonyms. You just need to highlight the word or the sentence you need to be clarified, and select the vocabulary-action you need to be done on it.

Listen to me, please! Is a useful tool that supports during your studying section, by reading out-loud the parts you need. It can read a sentence, a paragraph, or the entire chapter.

Let's concentrate! It is scientifically proven that music can help in focusing during studying. If you use to listen to the same song or playlist for a specific subject while studying it, it'd be even easier to remember.

The less, the best! Let the app know your studying, it'll block your devices to let you concentrate on your work. From the moment it's blocked, you'll earn points to get your rewards: discounts or special offers in your favourite shops. If you use your phone for leisure, no more points will be added.

No more fear, my dear is a useful tool to prepare you at the best. While studying you can highlights what possible questions you will find in the exam and their answers. When you feel ready, start playing! The system will provide you with useful games to test your preparation.

Share it is a community where you can meet your colleagues from other universities, share your interests, discuss topics, and meet new people.

The access to those tools depends only on the subscription category you applied for. To create the perfect subscription, we took inspiration from a famous company - Netflix - and we played with price. The following image shows our result:

LOGIN CATEGORIES

	Only what you get	Survival instinct	Exam in progress	Like a Prof
Price	Variable	€4.99	€7.99	€10.99
Book access	All database	Your course only	All database	All database
Profile	X	1	2	4
Extra tools:				
Doodle me	X	Yes	Yes	Yes
Like Dante	X	Yes	Yes	Yes
Listen to me, please	X	X	Yes	Yes
Count on me	X	X	Yes	Yes
Date me	X	Yes	Yes	Yes
No more fear, my dear	X	X	Yes	Yes
Let's concentrate	X	Yes	Yes	Yes
The less, the best	X	X	X	Yes
Share it	X	X	X	Yes
Unsubscribe when you want	-	Yes	Yes	Yes
First month for free	-	Yes	Yes	Yes
Freeze during holidays	-	Yes	Yes	Yes

Figure 14: UniProof login categories.
Created by Francesca Angusti using Canva.

Only what you get is based on the original idea. Students can log in the platform, search for their book, select the parts they're interested in and paying only what they get. The pricing model's aim is to avoid copy shops as the best alternative, and instead opt for UniProof. The competitive key of the app stands in its very little fixed costs. A common action through the same direction could push also book providers to put a bigger effort in the protection of their digital resources, increasing security and paying attention to free PDFs. In doing so, we could obtain good results in the medium-long period, limiting illegalities and increasing the revenues.

The other three login categories are in the classical form of subscription, allowing the top subscriber to a vast majority of tools than those in the previous ones.

The price is highly competitive, considering that the cost for a book is way higher than the subscription itself. This is clear how students can benefit from it, but what about book providers?

The pricing model we've adopted is the following:

- Calculate the *Total Revenues* from subscription:

$$\text{Total Revenues} = (N^{\circ}\text{BASIC} * €4,99) + (N^{\circ}\text{STANDARD} * €7,99) + (N^{\circ}\text{PREMIUM} * €10,99);$$

- The result is splitted in 20% granted for UniProof, and 80% availability for book providers. So, UniProof's 20% is a direct income for the platform - granted. The

80% is the available amount to be splitted among book providers in the following way:

- Calculate the *book provider weight* by dividing the total amount of books on the platform by the total amount of book uploaded by that specific

$$\text{provider: } \frac{\text{TOT n}^\circ \text{ books on UniProof}}{\text{TOT n}^\circ \text{ books uploaded by authorX}}$$

- The resulting percentage is then calculated on the 80% availability on total revenue, obtaining the *total availability for that specific provider*.

The total availability for that specific provider is converted into the relative percentage of income the provider is expected to receive:

If book provider' weight (%)	≤ 20%	21 ≤ x ≤ 65%	≥ 66%
% of relative income	45%	55%	70%

The *relative percentage of income* is calculated on the overall availability of the total revenue for that specific provider.

What about the difference?

The difference is used to push provider performance on the platform, by adding an *extra percentage* on its total income.

A counter will keep track of how much students use provider's material in a month. The result is expressed in percentage, and the calculation divides the total amount of pages that can be studied by the total number of pages actually studied. The total number of pages actually studied are counted by timing how much time students spend on pages.

If pages actually studied (%)	20% ≤ 60%	61 ≤ x ≤ 90%	≥ 91%
Extra %	40%	80%	100%

- The *extra percentage* is calculated on the difference of the availability amount

$$\text{Tot availability for that specific rovider} - \% \text{ of relative income}$$

- The total amount own to the specific provider is:

$$(\text{Tot availability specific} * \% \text{ relative income}) + [\text{Tot availability specific} - (\text{Tot availability specific} * \% \text{ relative income})] * \text{Extra} \%$$

Numerical example:

	N° BASIC subscriptions	N° STANDARD subscriptions	N° PREMIUM subscriptions
	1.500	3.000	9.000
Subscription price	€4,99	€7,99	€10,99
Partial revenue	€7.485	€23.970	€98.910
Total revenue	€130.365		

20% UniProof granted	80% providers availability
€26.073	€104.292

So, €26.073 is UniProof granted income, that may increase after splitting the availability of €104.292 among book providers.

We now consider book provider1, who uploaded 25 books on a total amount of 1.000 present on the platform. Its *specific weight* is $1.000/25 = 2,5\%$.

We calculate how much is 2,5% on providers' availability by:

$$€104.292 * 2,5\% = €2.607,30$$

So, provider1 could potentially earn up to €2.607,30.

Now, the percentage is compared to the table:

If book provider' weight (%)	≤ 20%	21 ≤ x ≤ 65%	≥ 66%
% of availability owe is	45%	55%	70%

Undoubtedly, we can state that $2,5\% < 20\%$, so the percentage of availability owed equals 45%. We calculate 45% on €2.607,30, and it results €1.173,29. This is the amount the provider owe based on its availability.

We move further by calculating the extra percentage. We suppose that the monthly percentage studied from provider1 equals 30%. We compare the percentage with the table:

If pages actually studied (%)	20% ≤ 60%	61 ≤ x ≤ 90%	≥ 91%
Extra %	40%	80%	100%

30% stands in between 20% and 60%, so the *extra percentage* for provider1 is 40%.

This, is calculated on the difference between

$$€2.607,30 - €1.173,29 = €1.434,01$$

$$€1.434,01 * 40\% = €573.604$$

The total amount provider1 will receive from its availability is:

$$€1.173,29 + €573.60 = \mathbf{€1.746,89}$$

The difference between provider1 total availability and its actual interest will be an extra earning for UniProof, in this case equal to:

€2.607,30-€1.746,89=€860,41

This business idea born from the necessity to make a difference and promote a changement. In fact, the problem is pretty known from the majority of people actively involved in the field, but it seems nobody is ready to put an effort in revolutionizing textbooks market fundamentals. Instead, it seems more comfortable to keep perpetuating in a dark market, with sensible negative outputs, and becoming day after day more unable to see and feel it.

UniProof idea and development is an easy one. The model is quite intuitive, as well as the pricing strategy described. It results to be a win-win zone for the real parties of the market: students and book providers. Obviously, we can't say the same for copy shops. In fact, the realization of the app would result in a significant negative output for them, that would lose a sensible amount of untraced money. Despite the unethical and illegal fact of printing above the maximum limit requirements, from the entrepreneurial position is easy to foresee a considerable decline in their market.

How to face it?

UniProof born as a digital book provider, able to put together many authors and publishing houses in one app, by being an intermediary between the two real parties.

Next to the digital use, it could also be improved a printed system in the form of classic delivery food companies. So, copy shops will enter the app, letting know the location where they're available. Students will give the command to print and UniProof will provide the copy shops with the exact parts students need. To do so, students are required to add a little fee, that will be equally divided with copy shops too. A delivery person will bring students their printed books.

It seems that UniProof will fall into the illegal system discussed previously.

Well, no!

The digital system provides authors and publishing houses with an income they don't earn and that they're currently not expecting to earn either. The only chance to open a possibility on due earnings is the creation of an unbiased system - such as UniProof.

Copy shops currently earn a major part of authors and publishing houses due earnings, without leaving a trace. Actual late student generations still prefer physical books instead of digital, but the gap is decreasing with upcoming generations. Anyway, printed books are a constant in the current scenario. Students will find solutions to have their books in hand. We might as well offer them the solution.

Let's suppose book providers allow their books to be printed only through the app, and the fee charged to students is very little. In this way book providers are open to the possibility of a printed copy of their, resulting more close to student needs, and students won't be attracted to a more cheap solution, because the fee charged will be the result of a careful analysis based on the average costs incurred for printing: for example price of paper and price of cartridges.

We've developed the idea for a while, but then we decided to stop. UniProof idea is an interesting one to go more in deep, but the structure is too heavy for today's scenario. The introduction of artificial intelligence and more sophisticated digital systems, has shuffled cards into boards. Today's expectations are sharpening and evolving quickly. Technology is exploring many fields and it's diving into the educational world too.

Definitely, there is no race between the traditional-system model on which UniProof is created, and the revolutionizing, perspective-changers driving the current digital and technological revolution.

Chapter 2

Artificial Intelligence

In the following chapter we provide an overview on artificial intelligence (AI), its characteristics, its application and how it could be declined in everyday life.

What is artificial intelligence?

In 2007, John McCarthy, a Stanford University student, defined it as:

“The science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable”³¹.

The abstract is structured as a Q&A section, and we want to highlight some more points discussed in there.

“Q: What is intelligence?

A: Intelligence is the computational part of the ability to achieve goals in the world. Varying kinds and degrees of intelligence occur in people, many animals and some machines.

Q: Isn't there a solid definition of intelligence that doesn't depend on relating it to human intelligence?

A: Not yet. The problem is that we cannot yet characterize in general what kinds of computational procedures we want to call intelligent. We understand some of the mechanisms of intelligence and not others.

Q: Is intelligence a single thing so that one can ask a yes or no question “Is this machine intelligent or not”?

A: No. Intelligence involves mechanisms, and AI research has discovered how to make computers carry out some of them and not others. If doing a task requires only mechanisms that are well understood today, computer programs can give very impressive performances on these tasks. Such programs should be considered “somewhat intelligent”.

Q: Isn't AI about simulating human intelligence?

A: Sometimes but not always or even usually. On the one hand, we can learn something about how to make machines solve problems by observing other people or just by observing our own methods. On the other hand, most work in AI involves studying the problems the world presents to intelligence rather than studying

³¹McCarthy, J. Stanford University. Retrieved from <https://www-formal.stanford.edu/jmc/whatisai.pdf>

people or animals. AI researchers are free to use methods that are not observed in people or that involve much more computing than people can do”³².

The year of publication seems to be far and since 2007 we’ve made great strides, but fundamentals keep being the same.

The first approach of AI is even older than 2007 abstract. In fact, the first approach to it is dated during World War II.

Britain was in the middle of the war and at a disadvantage against the Axis. It was undergoing a period of ferocious bombing, with a high number of deaths and destruction when, in 1939, the English received from the Poles a copy of *Enigma*, an electromechanical German encryption and decryption machine, used to communicate in security. Thanks to a cross-words, British created their team to discover the functioning of the machine. Alan Turin, a mathematician, philosopher and cryptographer, was actively part of the team. His intuitive skills let him understand that the only way to achieve the solution was through another machine. They developed a machine able to understand and analyse tones of German data , learning from practice and memorizing past messages. Those characteristics have been the inputs for Turing to theorize an artificial intelligence able to mirror human one. He developed the Turing Test.

The subjects involved in the test are 3: A, B and C.

A’s role is to lie on its gender;

B’s role is to say the truth and help in test resolution;

C’s role is to guess both genders of A and B.

Turing definition of AI machine is referred to the ability of the machine to substitute a human being without being recognized.

Today, no machine passed the Turing Test.

The interest on the topic goes back a long way. What is particularly interesting to notice is the huge development it’s experiencing nowadays.

In November 2022, Open AI launched its last product: *ChatGPT*. We guess it doesn’t sound new.

OpenAI born in 2015 as “a non-profit artificial intelligence research company. Our goal is to advance digital intelligence in the way that is most likely to benefit humanity as a whole, unconstrained by a need to generate financial return. Since our research is free from financial obligation, we can better focus on a positive human impact. We believe AI should be an extension of individual human wills and, in the spirit of liberty, as broadly and evenly distributed as possible. The outcome of

³² McCarthy, J. What is AI? / Basic Questions. Stanford University. Retrieved from <https://www-formal.stanford.edu/jmc/whatisai.pdf>

this venture is uncertain and the work is difficult, but we believe the goal and the structure are right. We hope this is what matter most to the best in the field”³³.

Among the founders, we can read famous names such as Sam Altman, Peter Thiel and Elon Musk, and financed by famous companies such as Amazon, Microsoft and the Silicon Valley itself.

Since 2015, machines have improved and developed considerably and day by day the amount of revolution and innovation in it is increasing more and more. This, is consistent with the *looking forward* section of the first document signed from all the major representatives of OpenAI in 2015:

“AI systems today have impressive but narrow capabilities. It seems that we’ll keep whittling away at their constraints, and in the extreme case they will reach human performance on virtually every intellectual task. It’s hard to fathom how much human level AI could benefit society, and it’s equally hard to imagine how much it could damage society if built or used incorrectly”³⁴.

First demo programs AI-based have been launched in 2016, but never hit the world scenario so hard to make it noticeable.

In 2019 it turned into a for-profit company, and received several funding for its researches.

In the late November 2022, they launched ChatGPT, marking a break with previous products. ChatGPT has been the pioneer of many more products AI-based, with different functions and functionings.

The company is now dealing with supporters and opponents - scared of possible negative outputs. OpenAI is aware of negativities that may arise from its job, and for this reason decided to keep the access open to everybody.

It’s interesting to see the core values of the company, to better understand the way it thinks, acts, and exists.

Audacious. We make bold bets and aren’t afraid to go against established norms.

Thoughtful. We thoroughly consider the consequences of our work and welcome diversity of thought.

Unpretentious. We’re not deterred by the “boring work” and not motivate to prove we have the best ideas.

Impact-driven. We’re a company of builders who care deeply about real-world implication and applications.

Collaborative. Our biggest advances grow from work done across multiple teams.

Growth-oriented. We believe in the power of feedback and encourage a mindset of continuous learning and growth”³⁵.

³³ OpenAI. Introducing OpenAI. Retrieved from <https://openai.com/blog/introducing-openai>

³⁴ OpenAI. Introducing OpenAI. Retrieved from <https://openai.com/blog/introducing-openai>

³⁵ OpenAI. Careers. Retrieved from <https://openai.com/careers>

Undoubtedly self-focused and goal-oriented.

The main characteristics of AI are its revolutionary drivers.

First of all *learning skills*. AI can learn from data and from its previous experience, identifying patterns, extracting insights and improving performance over time.

Talking with an AI-based chat will give the sensation of dealing with a smart tool able to remember previous conversations.

Adaptability is another characteristic. In fact, it is necessary to adapt to face different situations and tasks, as well as adjusting its behaviour for different scenarios. We can ask the chat to talk in a formal or informal way, as well as an expert of astrophysics, or even as a 5-year old toddler.

What's astonishing is its ability of *problem solving and decision making*. AI can analyse complex problems and offer the best solution, by explaining the reason why of its conclusions.

AI is *sensing*. It means that it doesn't exist only on chat form, but it can also interact through sight, voice, hear, images, video, financial statements [...].

AI is *NLP* - Natural Language Processing. AI understands human language and it's also able to replicate it, by providing proper answers to human-made statements.

AI is not only based on things already in existence, but it can even be *creative* and add *innovation*. In fact, it can generate new ideas, content and art in visual creations.

Those characteristics are the result of a careful online analysis and common sense. But we're curious to get some direct and unbiased insights from AI. Here is an extract of the conversation between me and ChatGPT:

“ Q: Hello ChatGPT. Who are you?

A: Hello! I'm ChatGPT, a large language model developed by OpenAI. I'm an AI designed to assist and engage in conversations with users like you. I've been trained on a wide range of data from the internet to help provide informative and helpful responses. How can I assist you today?

Q: I want to know everything about you

A: Certainly! I'm an instance of the GPT-3.5 architecture developed by OpenAI. GPT stands for “Generative Pre-trained Transformer”, which refers to the model's structure and training method. Here are a few key points about me:

1. Language Understanding: I'm designed to understand and generate human-like text based on the prompts or questions I receive. I can assist with a variety of tasks, such as answering questions, providing explanations, offering suggestions, engaging in conversations, and more.
2. Training: I've been trained on a diverse range of internet text, including books, articles, websites, and other publicly available sources. This helps me generate responses based on patterns and information from the data I've been exposed to.

3. Limitations: Although I strive to provide accurate and helpful information, please keep in mind I'm an AI model and may occasionally generate incorrect or misleading responses. It's always a good idea to fact-check important information and consult multiple sources when necessary.

4. Constant Learning: As an AI language model, I don't possess personal experience or awareness. My responses are based solely on the information I've been trained on. I don't have access to real-time data or the ability to browse the internet.

5. Ethical Guidelines: OpenAI has implemented safety measures and ethical guidelines to ensure responsible use of AI. While I aim to be helpful and respectful, there may be times when I cannot provide certain types of information or engage in discussions that violate those guidelines.

[...]

Q: Are you a revolutionary tool?

A: As an AI language model, I can certainly be seen as an innovative and transformative tool in the field of natural language processing. My capabilities have the potential to revolutionize various aspects of human-computer interaction, information retrieval, and language-based tasks.

AI language models like myself can assist with a wide range of applications, such as virtual assistants, customer support, content generation, language translation, and much more. By leveraging the vast amount of data I've been trained on, I can generate human-like responses and provide assistance across different domains.

However, it's important to note that the revolutionary nature of any tool depends on how it is utilized and integrate into various contexts. AI technologies can bring significant benefits, but they also raise important ethical considerations and require responsible deployment to ensure they are used in a manner that aligns they with societal values and norms.

Ultimately, the extent to which AI tools like me are seen as revolutionary depends on the impact and value they bring to users, businesses, and society as a whole".

Amazing! Its degree of argumentation, its speaking with knowledge of facts, its precision as well as its ability to recognize limits and possibilities is undoubtedly something never seen before.

We're in front of a new tool, more sophisticated than the previous ones, and its usage covers a wide range of fields.

Maybe, the revolutionary power in it still seems little, and probably few people are able to imagine a world AI-based, foreseeing its negativities as well as its positivities. No matter people's level of understanding, what matter is that we're facing a growing technology, with a never seen before change power, able to modify the course of future history.

Technology, Innovation and Hyper-connectivity

In this section we're going to see the relationship, if it exists, between artificial intelligence and the three milestones of modern society - Technology, Innovation and Hyper-connectivity. Does AI fit in modernity or it's futuristic?

AI&Technology

Technology and AI live a symbiotic relationship, and we could say that AI is a product of technology, able to leverage cutting-edged algorithms and computational power. It's the pinnacle of human ingenuity, aiming to replicate and, maybe, surpass human cognitive abilities.

When we talk about technology, we refer to the practical application of scientific knowledge, tools and techniques used for practical purposes - for example improving human life and environment.

Instead, when we talk about AI, we refer to the creation of intelligent machines that can potentially substitute human intelligence. The complexity is greater than traditional technology-based tools. In fact, it is based on the usage of algorithms, data analysis, and machine learning techniques to allow computers in performing their tasks. The main difference between AI and technology, is that AI has the ability to learn, reason and take decisions based on insights.

Currently, the ubiquitous nature of technology hasn't fully achieved AI, even if it's rapidly expanding into new fields and adopting new and different forms of use.

We have to remember that AI born thanks to technology advancements that have enabled the creation of sophisticated models able to interact with humans.

At the same time, also AI is playing a significant role in advancing technology, by developing innovative tools, techniques and systems in order to increase productivity, efficiency and problem solving.

We've already mentioned the symbiotic nature of AI-technology relationship. Technology provides the resources for the development and deployment of AI, and it receives new approaches to advance. This continuous evolution feeds into each other, leading to an increase in innovation and improvement.

With the progress of technology, AI expectation to be crucial in shaping the future is increasing. Together, they have the potential to make positive changes in different society fields, for example healthcare, education, and communication.

AI&Innovation

The relationship between AI and innovation does exist, with AI being both a product of innovation and a catalyst for further innovation.

AI and innovation share a close relationship, with AI being both a product of innovation and a catalyst of upcoming innovation.

So, AI is an innovation itself. It is an advancement in technology and computing abilities and thanks to its characteristics - machine learning, adaptability, problem-solving, decision-making - it can bring numerous innovations in many different fields.

The innovations it can bring are categorized in two ranges: AI-powered applications (Ex. Chat GPT, Midjourney, Dall-e), and area advancements (Ex. in healthcare, education, finance). All this is possible thanks to AI ability to automate processes, analyse a huge amount of data, take smart decisions that lead to industries revolutions and pave the way for new possibilities.

But AI requires innovation to exist. AI boundaries are push forward because of innovators and researchers that constantly seek for new models, techniques and algorithms to satisfy upcoming needs. Their aim is to develop accurate and further advanced systems, decline AI in new applications, reduce limitations and face challenges. All this leads innovation to breakthroughs solutions.

We don't have to forget that the revolutionary nature of AI can sometimes clash with societal values. For this, it's essential to address privacy, security and ethics challenges to ensure a mutual benefit for humanity as a whole. In other words, innovation should be responsible, ethics should be taken into consideration, and safety should be granted .

The relationship we're investigating on isn't a one-way street. It's a dynamic interplay where AI is in the double role of being an innovation product and being an innovation driver.

AI&Hyper-connectivity

We've already discussed on the relationship between technology, innovation, and hyper-connectivity. So, it is consistent to say that also exists a relationship between hyper-connectivity and AI.

Hyper-connectivity is made of a variety of tools all connected to internet, and it provides both the infrastructure and data system to allow AI to work effectively. Not only hyper-connectivity is useful to AI, but event the reverse. AI optimize hyper-connectivity abilities and improve better communications and interactions, resulting as more smart and efficient.

Hyper-connectivity structure is made of a billions of devices that generate tons of data that are further processed by AI systems to extract insights, trends and patterns. Those all together contribute to the functioning of hyper-connectivity itself, presenting a really complex intercorrelated scenario, but also necessary to its purpose.

In the AI and hyper-connectivity relation, a key role is played by efficiency and effectiveness. Tools provided with AI have a better response to changing conditions because they can evolve and be reshaped by the data they're based on. This, leads to improve performance, optimize operations, identify and adjust errors, and so reducing downtimes and increasing reliabilities.

The relationship can be extended to various fields, for example Internet of Things, smart cities, voice assistants, public safety and many more.

In conclusion. The relationship between AI and technology, innovation and hyper-connectivity exists, and it's very tight and strong.

AI's integration in modern society is not only futuristic, but also a present reality. The relationship is strongly interrelated and mutually beneficial. As these fields continue to evolve and interact, the potential for positive changes in society is promising, expecting a further and stronger merger in the near future.

Solow, Knowledge Economy, Fourth Industrial Revolution

It's is now interesting to see the relationship between artificial intelligence and three models we've discussed so far: the Solow Model, the Knowledge Economy Model, and the Fourth Industrial Revolution Model.

Is AI a significant component of them?

AI&Solow model

AI has the potential to make a significant impact on the key drivers that compose the Solow model, specifically technology and innovation. We've already investigated the relationship between AI and technology and innovation. So, let's apply what we've discussed so far to the Solow model.

Technology (k) is one of the key drivers of economic growth. In fact, technological progress leads to increases in productivity, and economic growth as well. Thanks to AI, technology improves and physical capital augments, resulting in a greater efficiency and productivity, as well as a greater output and economic growth in general.

Instead, innovation (A) means introducing new products, ideas and ways of doing things, causing the shift of the output line. AI can lead to new solutions and outcomes, thanks to its analytical skills.

Not only technology and innovation, but even hyper-connectivity plays a central role in the exchange of ideas and innovation, and AI facilitated the transmission process. In fact, hyper-connectivity is the consistency factor that links economies from all over the world. The rapid exchange of ideas and innovations made possible by hyper-connectivity can accelerate the diffusion of technology across countries, which can lead to a faster economic growth.

Another aspect when talking about this relation, refers to the potential disruption power of AI on L - labor. In the Solow model L is a key input responsible for economic growth. AI focuses on technologies and on the leading position they have with respect to humans, sharpening automation outcomes as well as unemployment rates. For this reason, it is important to smoothly introduce AI in the model, striking a balance between leveraging the benefits of AI and prepare employers for the change in nature of work.

AI&Knowledge Economy model

The Knowledge Economy model emphasizes the importance of knowledge, innovation and ICT in the economic growth and development. AI contributes to all of these aspects.

First, AI increases knowledge creation by empowering its algorithms and by automating tasks as well as augmenting human capabilities. In this way, AI frees up time and resources for researchers and innovators to focus on creative problem-solving, thus driving innovation in the Knowledge Economy.

AI is made by innovation and addresses to new innovation. This means, that to reach the next innovative level AI requires highly-knowledge-skilled professionals able to push the boundaries so to develop a more accurate and advanced system that could lead to a breakthrough solution.

AI&Fourth Industrial Revolution model

The Fourth Industrial Revolution model is a perfect mix of all the three words we've already investigated on - technology, innovation and hyper-connectivity. It is the fusion of digital technologies, physical systems, and biological advancements. It's a new era of technological innovation and disruption, with AI at the forefront of driving this revolution.

The FIR includes AI, as well as robotics, IoT, and other advanced technologies. FIR is known for its automation and augmentation of tasks and processes, and together with AI is transforming industries. Its data-driven approach supports businesses to make informed decisions, personalizing services and offering a better customer experience. It's crucial in the development of intelligent systems to better understand customers needs and behaviour, assisting them properly and communicate clearly.

This relationship is probably the most explicative of the three taken into exam as it reconciles the main points all in one.

We can conclude that AI is those models. They're growing together and they are beneficial to each other. AI is pushing models so far, and at the same time the models structure perfectly matches with AI fundamentals. And if t technology, innovation and hyper-connectivity are the present, and if the Solow model, the Knowledge Economy model and the Fourth Industrial Revolution model are the glue, it's logically arguable that AI is the beginning - as a new born - of our present.

AI&University system

What is the relationship between University and IT?

University and IT experience a controversial relationship, based on love and hate. Technology is an excellent tool widely used by students, professors and researchers to support and simplify daily activities, but sometimes it is perceived hostile and we have the sensation it's undermining us.

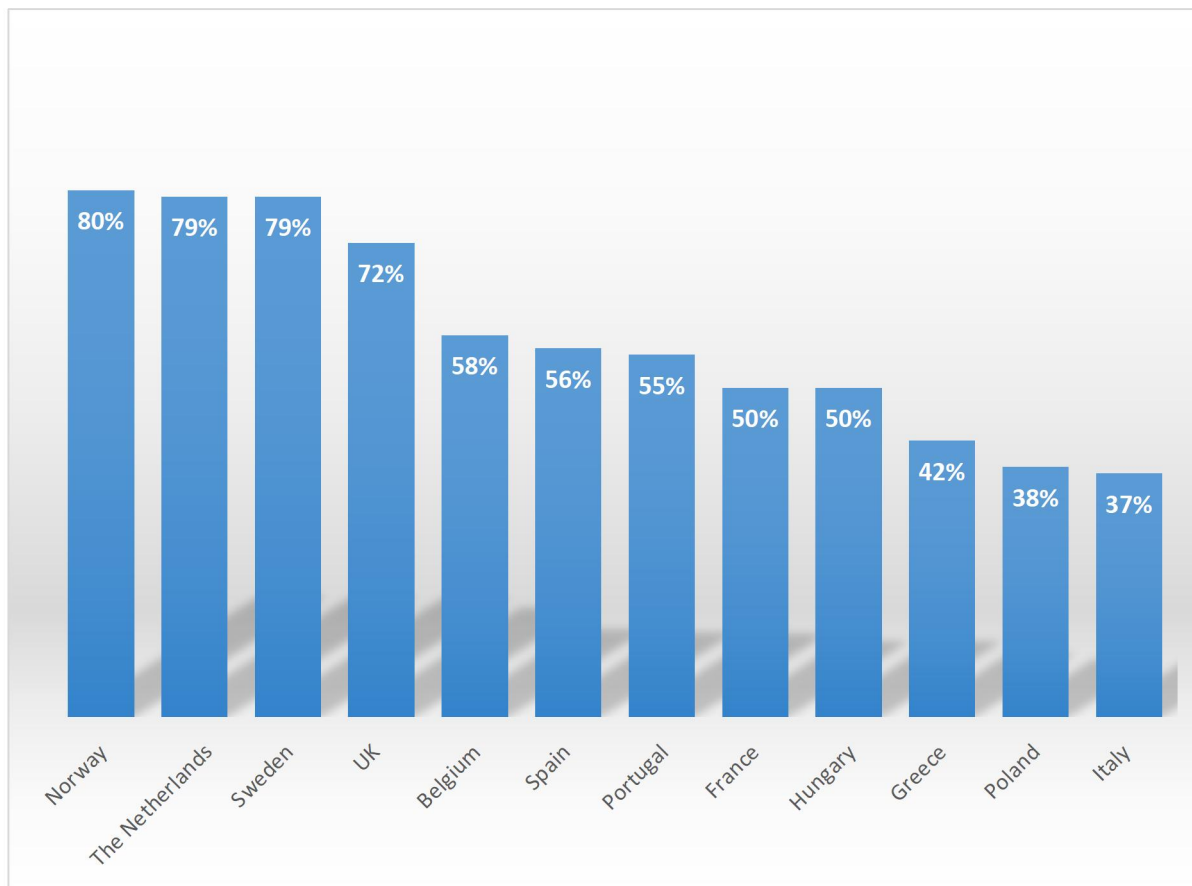
Could you imagine a world where no technology is available? Where, instead of typing your keywords in a search banner, you go to a physical library and you start looking for the right encyclopaedic, browsing an uncountable number of pages in the hope to find the answer you're looking for? Could you quantify how much time you would lose in doing so? But more important, are you aware of the great benefits you have just a click away?

Today, technology is largely used in education. We communicate through technology - academic email, official university social profile, website - we attend classes and do project works - internal platforms such as Teams, Moodle, Slack - we buy textbooks - e-commerce of book shops or throughout the famous Amazon - we look for internships and Erasmus or we apply for our first job! Technology is a constant, but something isn't working properly.

Italy is in the 29th³⁶ European position in the OCSE research on digital illiteracy, with only a 37% of people between 15 and 65 years old able to use it in an advanced form. The percentage isn't equally splitted within the age-range, but as we could expect, it is a descendent curve, with younger being more skilled then elders.

It follows two charts: the digital literacy comparison among countries and the percentage of digital skills in a range from illiteracy to advanced (from < 1 to 6, where <1 is highly illiterate and 6 is advanced).

³⁶ Italia in dati. Analfabetismo digitale in Italia. Retrieved from <https://italiaindati.com/analfabetismo-digitale-in-italia/>



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This chart shows the percentage of digital literacy of Italy, with respect to other European countries. Also this time, Italy isn't relevant in the statistics, presenting a significant gap with the first one - Norway. The reasons why of this discrepancy are numerous, but we can summarize them in:

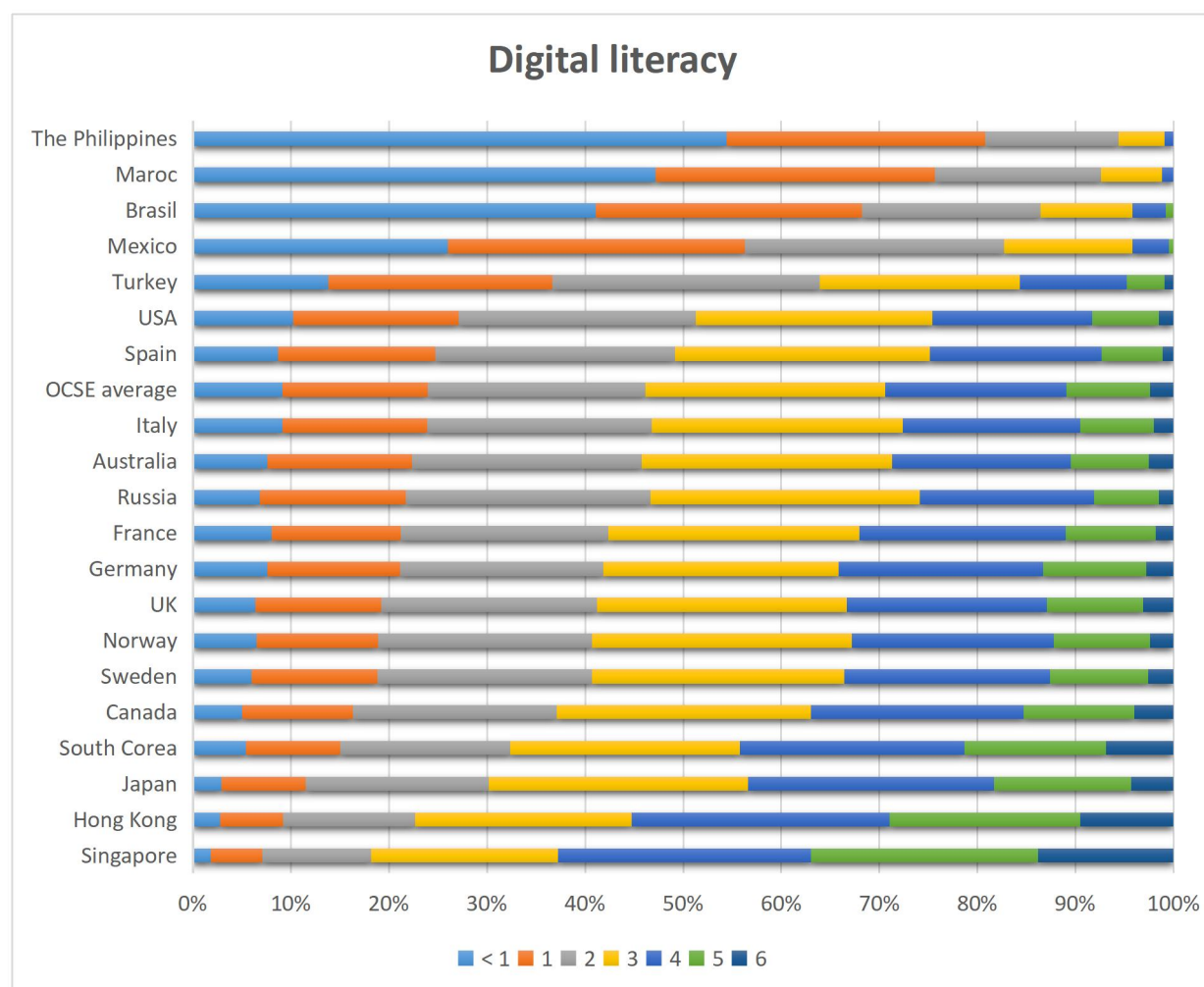
- *Age access.* Over 50 aren't used to technology and aren't prone to use it either. The weight of their choice is reflected on international statistics, lowering the average;
- *Digital infrastructure.* In 2019, 74,7%³⁸ of Italian families didn't have access to broadband connection;
- *Low motivation in use.* Italian culture is very rooted on humanistic subjects. This, disincentive scientific ones;
- *Job market.* Job market doesn't reward digital skills properly.

What catches the eye is that 3/4 points are based on mentality and point of view. In fact, only digital infrastructure could be considered as a limit - hopefully temporary.

³⁷ Italia in dati. Analfabetismo digitale in Italia. Retrieved from <https://italiaindati.com/analfabetismo-digitale-in-italia/>

³⁸ Italia in dati. Analfabetismo digitale in Italia. Retrieved from <https://italiaindati.com/analfabetismo-digitale-in-italia/>

This second chart, instead, presents a complex mix of data. The scale < 1 - 6 refers to the level of digital literacy, with 6 being the highest one. It reports a comparison between many countries all around the world. Level 2 is considered the basic level for an IT beginner.



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Overall, Italian level is not worrisome, but we never excel.

Are we destined to live in the shadow of countries a few kilometres away from us?

In 2019, OCSE affirms:

“Italian population doesn’t have basic competencies necessary to flourish in a digital world, both in society and on work place”⁴⁰.

³⁹ Italia in dati. Analfabetismo digitale in Italia. Retrieved from <https://italiaindati.com/analfabetismo-digitale-in-italia/>

⁴⁰ Ezoic. Analfabetismo digitale e informatico in Italia: i dati sono allarmanti? Retrieved from <https://tech.icrewplay.com/analfabetismo-informatico-digitale-italia-dati/>

But the real revelation came with COVID-19 pandemic. The quarantine has been the factor that tested our level of flexibility and adaptability. It revealed that the percentage of digital illiteracy was even more high, equal to 79%⁴¹.

Some valuable solutions could be:

- *Own a computer.* Having a personal computer is the first step to explore it uses. Nowadays, a lot of people discredit PCs because of smartphones. They aren't the same thing!
- *Learn English.* To get a deeper knowledge, it is favourable to understand English. In fact, a lot of tutorials, instructions, coding and data are in English. This solution matches with the lack in English courses all around the world.
- *School digitalization.* Let's eradicate illiteracy from the place in charge of learning: school. Digital schools, or schools that promote and support digitalization, could be the starting point for an overall society improvement.

Once again, we are maybe looking in the right direction, but the path may be full of obstacle, and we are may be not ready. The title of this section is not wrong. The aim is to investigate on the relationship between AI and university. But, how could we if we aren't ready for technology either?

We'll try by having a look at AI strengths, weaknesses, opportunities and threats.



Figure 15: Artificial Intelligence - Strengths.
Created by Francesca Angusti using Canva.

The main **strength** of AI that has twisted the modern landscape stands in its *superhuman intelligence*, able to process a very huge amount of data, with precision, attention and quickness.

⁴¹ Ezoic, "Analfabetismo digitale e informatico in Italia: i dati sono allarmanti?", <https://tech.icrewplay.com/analfabetismo-informatico-digitale-italia-dati/>

From the data, AI systems *keep learning* and evolving. Not only from data, but even from mistakes. AI systems are consistent with the Evolutionary theory.

For this, AI systems can easily *adapt* themselves in different contexts, promoting its diffusion. They are amazing *decision makers*, sorting a rational, unbiased, algorithm-based solution.

All this leads its *automation* power to optimization, efficiency and productivity of operations.



Figure 16: Artificial Intelligence - Weaknesses.
Created by Francesca Angusti using Canva.

Its characteristics that built its strengths, leads also to some **weaknesses**. First of all, its *dependency on data*. Data are AI systems oxygen. So, they can only provide statements on things already investigated. For this, they have a *limited generalization* ability to transfer, extrapolate and elaborate data in a different context from the one those data are part of.

Its *lack of conciousness* affects its ability of inter-correlation, resulting sometimes static. Also its *lack of creativity* affects its ability to create something new. Another important limit of AI systems refers to its *ethical challenges*. AI systems struggle in understanding human ethics and values, for this, it could suggest unethical solutions.



Figure 17: Artificial Intelligence - Opportunities.
Created by Francesca Angusti using Canva.

The **opportunities** offered by AI are numerous.

The main one is related to the *problem-solving* opportunity offered by AI towards complex problems that involve massive amounts of data. It would require humans a lot of time to solve them. For AI systems is faster. So, the second opportunity refers to the *collaboration and coexistence* among AI and humans. AI are a supportive tool for humans, that could be declined in many different fields, with good outputs. Good output and feedback can bring, in the best of the hypothesis, to *innovation* and *revolutions*. Using AI's power to conduct a discovery, could reveal huge opportunities for search conducted. It could even result in a further *AI advancement*.



Figure 18: Artificial Intelligence - Threats.
Created by Francesca Angusti using Canva.

Last, the **threats** we should be careful about when talking about AI. AI systems could be *manipulated* or used for *harmful proposals*. This could put on risk privacy, security and social well-being.

Due to its *human-nature dependence*, AI systems could contain errors, and sometimes humans could not intervene on time to limit the spread of those. This could also lead to *technological limitations* that affect its full potential.

Last, the main scare is the one related to *unintended consequences* with undesirable impacts on society.



Figure 19: Artificial Intelligence - SWOT Analysis.
Created by Francesca Angusti using Canva.

From AI's SWOT analysis we can understand it is a computational tool, enriched with awareness in presenting a topic or generally in arguing it, with extraordinary and unexplored potential for the future. *What does the future hold for us?*

The current global discussion of AI is touching many different aspects, and it seems that to every positive point, there is another ready to highlight the bad in it.

We love all the benefits we can get from it, speed, accuracy, free access, but we're worried for our jobs to be replaced by robots, for students to cheat on their exams, of AI to take control of humanity.

Everything so controversial!

For this, what we are gonna try to do, is to provide a point of view that takes into consideration both pros and cons.

The story of humanity is quite common. Today human species is the result of years of evolution, in which humans have adapted themselves and have constantly looked for having an easier life inventing tools and facilities. We should look to AI as the last and new tool of human species to empower its existence and get an easier life. If we look it this way, we'll feel less pressure on negative outputs that may arise.

This is the main assumption and the reading-key we should keep in mind.

The first and main fear is related to jobs. It very common to see titles going like “Robots are stealing our jobs”, or “Are robots a threat or an opportunity?”, “The robot era and the end of work”. And there are many more to write.

For sure, and we have already insights of it, robots and technology in general are part of work, and sometimes are even the main characters of the process. We can't deny their presence, as well as we can't deny their substitutions in some jobs. So yes, robots are somehow substituting humans. *Is it that bad?* Maybe for a father of the family it is. *But, why?* Because they have no options.

We grow up with little, or at least none, financial skills. We grow up to become employees, depending on someone else willing, unable to create our own parachute in case of emergency. We think we provide to ourself and our family, but at the first obstacle we are more prone to give up. *Is this what evolution taught us?* It's the easier road. But it's also true that the easier road is the first to fall. *Why can't we try to see the opportunity in a changing landscape? Why do we never have a stable, coherent, reachable plan B in progress yet? Is it really a problem of technology that is coming into our lives, or maybe is because we aren't ready to abandon our comfort zone?*

The Chinese entrepreneurship Jack Ma in a speech on AI and jobs, said:

“Don't believe that technology is going to take away human beings jobs. Technology is going to replace a lot of stupid jobs. When the first technology revolution come, the Steam Machine come, people were worried “Oh My God, Steam Machine is going to take up a lot of jobs”. After 50 years, the Steam Machine created more jobs. Artificial Intelligence, they will create more jobs. The problem is next 20 to 30 years may lose, create lose a lot of job, but this is a short period. So, we people have to learn how we can survive in the artificial intelligence period. If you want to be ready for future, please, do not follow yesterday's way of learning and teaching. Do not try to memorize things hard and more, because computers can remember things hard and more than you. Do not try to calculate faster, because computer can calculate much faster than you do. So, try to be creative, try to be innovative, try to be constructive”⁴².

He refers to a circular course of history that seems to repeat itself infinitely by changing the topic and not the way.

Another noticeable participation is the one of Samuel Altman, OpenAI's CEO. When asked by Mr. Blumenthal during the testimony Congress on AI risks about “What your biggest nightmare is?”, Altman replied:

“Like with all technological revolutions, I expected there to be significant impact on jobs, but exactly what that impact looks like is very difficult to predict. If we went back to the other side of the previous technological revolution, talking about the jobs that exist on the other side, you can read what people said about it that time. I believe that there will be far greater jobs on the other side of this and the jobs of today will get better. First of all, I think it's important to understand and think about

⁴² <https://youtube.com/shorts/PIE1nHEslMM?feature=share>

ChatGPT4 as a tool and not a creature, which it's easy to get confused. It's a tool that people have a great deal of control over on how they use it and, second, ChatGPT4 and other systems like it are good at doing tasks, not jobs. So, you see already people that are using ChatGPT4 to do their job much more efficiently by helping them with tasks. Now, GPT4 will, I think, entirely automate away some jobs and it will create new ones once we believe will be much better. [...] The history of technology is one long technological revolution and not a bunch of different ones put together, but this has been continually happening. As our quality of life raises and as machines and tools that we create can help us live better lives, the bar raises for what we do and our human ability and what we spend our time goes after more ambitious and more satisfying projects. So, there will be an impact on jobs, and I think it'll require partnership between industry and government [...] to figure out how to mitigate that, but I'm very optimistic about how great the jobs of the future will be"⁴³.

AI seems to be the natural evolution of the human species, a necessary discovery whose basements have been created by people long time ago. What is more heartening is that even the CEO still sees more opportunities than threats.

Talking about education, it's not relevant to talk about the possibility of students to cheat. It's inconsistent! It's not AI the starting driver of cheating, but instead a mark-based system together with the pressure to be on time that defines your future job opportunities. Instead, let's talk about relevant aspects in the relationship between education and AI.

We got a significant insight from Sal Khan, American educator and founder of the Khan Academy. In an interview he answered to the question "What do you think education will look like in 1000 years?" like:

"I don't know! [...] But I think over the next 30 to 50 years, we are going to have a world where everyone on this planet is going to have access to all the core academic material and non-academic material they need to be a fully actualized person"⁴⁴.

The main reason why UniProof can't be developed.

Mr. Khan's words are consistent with his career in the educational world, following the path of a famous pedagogic, Benjamin Bloom, he founded Khanmigo Academy, a revolutionary AI-based tool whose aim is to provide free education all over the world, thanks to its highly performant system. After his TedTalk presenting his new invention, Dr. Philippa Hardman related the Khanmigo founder to Bloom, by presenting the educational revolution he has introduced many decades ago.

"Educational psychologist Benjamin Bloom had been researching for around about two years on a really interesting research question "what is the optimal conditions for human learning?". Bloom observed that through a combination of precedent tradition practicality, we have inherited a system of teaching and learning which is

⁴³ C-SPAN. May 16th, 2023. Open AI CEO Sam Altman: "If this technology goes wrong, it can go quite wrong". <https://youtu.be/Pn-W41hC764>

⁴⁴ Big Think. October 15th, 2021. Sal Khan's plan to educate the world. <https://www.youtube.com/watch?v=i9i5i1Xnemw>

all about a sage on the stage. The teacher is the conveyor of information. The student is the person who absorb the information and regurgitates it and/or perhaps restructures and re-frames it. This is the fundamental basis of the Learning Experience. What Bloom found was that the optimal learning experience for a human is very different. He found that for all learners, but especially for non-traditional learners. If we change the sage on the stage knowledge transfer system to a system of instruction that is more about proposing problems and projects, learning not by being told something, but by being asked something. Learning by exploration and research. Learn by getting things wrong and then correcting them. Learn through comparison and discussion. The problem-based Active Learning approach and the increase support in one-to-one coach support, transform learning outputs for everybody, but especially for under-represented groups. [...] That didn't happen. We have had education technology for 30-40 years since Bloom. But technology has consistently been used not to introduce this new system which we know works better, but to reinforce the old system. So, to make us better and faster at ineffective practice⁴⁵ .

To support her point of view, Dr. Hardman highlights the effectiveness of digital tools used in education nowadays, for example Power Point, or the interactive whiteboard. They don't bring innovation, they just provide a little support, but aren't effective. In her opinion, the risk we may face is that we'll decline AI technology "not to innovate our pedagogy and our impact on outcomes, but to accelerate and automate this broken knowledge transfer process"⁴⁶. And, to answer the question "AI is finally going to disrupt education?", Dr. Hardman replied: "I don't doubt for a second that AI is able to disrupt education . AI is absolutely able, right now, to deliver on Bloom's vision of where every student achieves more faster. But a more interesting question is "Will we allow it to do that?" We've been in the position where we could do that now for maybe 30 years, but for whatever reason we've used technology as a force for shoring things up as a force for continuity, rather than a force for change"⁴⁷.

The power of AI exists, but it's unexpressed yet.

Dr. Hardman identifies three groups that came up with the advent of AI. The first - *Team Avoid* - reacted very loudly. To avoid a possible broken scholar system based on students asking AI to write their essays , team avoid decided to get everyone back at school, asking them to develop their assignments in class, with supervisors making sure no digital support is involved.

The second - *Team Ban It* - is based on the team avoid values, but it wants to find a valuable reason why to ban it, by detecting AI-made contents. This action has been

⁴⁵TedX Talks. May 4th , 2023. The AI Education Revolution is Coming -or is it? | Dr. Philippa Hardman| TEDx SantaBarbaraSalon. <https://www.youtube.com/watch?v=it0N6XnW7ZY>

⁴⁶ TedX Talks. May 4th , 2023. The AI Education Revolution is Coming -or is it? | Dr. Philippa Hardman| TEDx SantaBarbaraSalon. <https://www.youtube.com/watch?v=it0N6XnW7ZY>

⁴⁷ TedX Talks. May 4th , 2023. The AI Education Revolution is Coming -or is it? | Dr. Philippa Hardman| TEDx SantaBarbaraSalon. <https://www.youtube.com/watch?v=it0N6XnW7ZY>

contested by students able to circumnavigate data detection, by cleaning data in a non-detectible way.

The third - *Team Embrace* - supporting and including GPT and other AI-based system in classroom.

“Team Embrace is where the future is going!”⁴⁸.

AI is the new frontier of education, able to speed up learning processes in a more supportive and inclusive way, taking into consideration students leaning differences, focusing on students tastes, and balancing theory and practice. The kind of change we all need.

The other big scary aspect related to AI is linked to negative externalities that may, in the worst scenario, take over humanity and become the future intelligent “species” that will manage the world. AI-specialists take into consideration even this possibility. Two main exponents of AI- Elon Musk and Sam Altman - they both agree on the fact that AI may reverse the societal hierarchy, changing forever the human existence.

Whereas Musk seems to be negative on this fact, defining AI more danger than nuclear war, able to survive forever, Altman has a more positive point of view, considering it possible, but just in case not in the near future.

Both of them agree on the role of governments in the fact.

Musk said:

“The way in which regulation is put in place is slow and linear, and we’re facing exponential threat. If you have a linear response to an exponential threat, it’s quite likely the exponential threat will win”⁴⁹.

And Altman claimed:

” I don’t think current systems are dangerous. I don’t think there’s any way that GPT4 causes an existential risk to the world, but people are very bad in thinking at exponential curves and GPT 10 may be totally a different thing. Given the importance of getting this right, even if it’s a one percent chance, I think putting a lot of effort into studying how we align an AGI, how we design a safe system at this kind of scale is super important”⁵⁰.

So, Musk is scared for the process to be too fast in a way that human can’t adapt or face it timely. Whereas Altman consider the option of robots to take over on humanity, defining it remote and highlighting that they’re working on it with great advance.

⁴⁸ TedX Talks. May 4th, 2023. The AI Education Revolution is Coming -or is it? | Dr. Philippa Hardman| TEDx SantaBarbaraSalon. <https://www.youtube.com/watch?v=it0N6XnW7ZY>

⁴⁹ The not so boring Man. March 12th, 2023. Elon Musk’s Brutally Honest Opinion on ChatGPT and His Involvement https://www.youtube.com/watch?v=eg9qDjws_bU

⁵⁰ The Economic Times. June 7th, 2023. ET Conversations with ChatGPT founder: Sam Altman on fears from AI and more | Full Video. <https://www.youtube.com/watch?v=H1hdQdcM-H4>

It's hard to be sure on a positive future without inconvenients to arise, but the words of relevant and important experts such as the ones previously quoted, can help the sceptics to have a more bright and optimistic view on what is going to come.

Chapter 3

In five years' time

In this last chapter we want to provide a direct insight on the University System and AI, making a projection in the future. What is more interesting is that we won't be the ones to make the prediction, but instead AI will do it.

For this, we are going to provide ChatGPT⁵¹ with several different issues to deal with, to see how AI could impact on education.

The following chapter is composed of many stories, with characters, problems and solutions.

Choosing the Future - A new era of decision-making

Once upon a time, in the quaint town of lighthouse Point, Florida, lived an ambitious high school senior named Jake. A brilliant student with a particular interest in environmental conservation, Jake was often lost in a sea of questions about his future. With the myriad of college programs and the rapidly evolving job market, the prospect of choosing a path was daunting, but Jake lived in 2028, a time when AI had transformed the decision-making process.

Jake's journey began with "Pathfinder", an AI-powered career guide provided by his high school to assist students with their academic and career decisions. Pathfinder was not just a program; it was a sophisticated decision-making tool designed to understand the user, making the process personal, engaging, and insightful.

Pathfinder began with a comprehensive "Understanding You" phase. This involved a series of well-crafted questionnaires and games designed to evaluate Jake's interests, values, strengths, and aspirations. They ranged from simple queries about his favourite subjects to more complex situational judgement tests. Jake found these exercises quite engaging, often forgetting they were assessments, as they felt like an adventure into self-discovery.

⁵¹ OpenAI. Chat on the future of the University system if AI is introduced and implemented. Retrieved from <https://chat.openai.com/share/e3cab670-6aba-4023-98d9-c28982b4a4dc>

Once Pathfinder has a solid understanding of Jake's profile, it moved into the "Exploration" phase. Using its complex algorithms and an extensive database on global educational trends, Pathfinder mapped Jake's profile to potential academic fields. It introduced Jake to the rapidly evolving field of Environmental Informatics - a blend of environmental science and data science - that aligned perfectly with his interests and strengths. It was a eureka moment for Jake - he found a field that connected his love for nature with his knack for data analysis.

Pathfinder also provided a wealth of information about the field, including key subjects, the skill set required, prospective universities offering of the course, future job opportunities, and potential salary ranges. Pathfinder also introduced Jake to professionals in the field through virtual meet-ups, offering him insights into the real-world applications and challenges of Environmental Informatics.

The "Decision Making" phase was where Pathfinder brought everything together. It provided a comparative analysis of the potential universities based on their curriculum, faculty, resources, research opportunities, placement statistics and student life. For Jake, Pathfinder recommended Ivy Tech University, a leading institution in Environmental Informatics.

Pathfinder's role didn't end there. It guided Jake through the application process - aligning his strengths and experiences to the course requirements, helping draft his application letter, and preparing him for potential interview questions. All these features, packaged within an engaging, user-friendly interface, made the decision-making process not just stress-free but enjoyable for Jake.

Pathfinder also emphasized the importance of lifelong learning and adaptability in a rapidly evolving world. It encouraged Jake to revisit the platform regularly to update his profile, explore emerging fields, and identify areas for continual growth.

Jake's story ends with him receiving his acceptance letter from Ivy Tech University. But in many ways, this was just the beginning. Pathfinder has not only helped Jake make an informed decision, but also given him a broader understanding of himself and his place in the world. Jake was now ready to embark on his university journey, reassured that he was on the right path and equipped with a powerful tool to navigate future career decisions.

Navigating new beginnings -The AI-assisted University journey

In the vibrant city of Boston, Massachusetts, a freshman named Lily steps into the sprawling campus of Beacon University. An international student from Dublin, Ireland, Lily is filled with a mix of excitement and apprehension. However, Beacon University is no ordinary institution - it's a front-runner in AI integration in education. And for Lily, this meant a smooth, personalized orientation process.

The AI-assisted university journey begins with “UniCompanion”, an AI-powered university guide, easing the transition of students like Lily. From the moment Lily receives her acceptance letter, UniCompanion becomes her personal guide to university life.

UniCompanion starts by giving Lily a virtual tour of the university, taking her through the academic buildings, dormitories, libraries, sports facilities, and even popular off-campus hangouts. Despite being thousands of miles away, Lily feels a sense of familiarity with her new home.

Next, UniCompanion introduces Lily to her personalized academic schedule. Using AI algorithms, it considers her learning preferences, sleep patterns, and personal interests to draft an optimal timetable. It ensures she has a balanced workload and enough free time to engage in extracurricular activities and manages to fit in the practice timings of the university’s soccer club into her schedule.

But UniCompanion does more than just organize schedules. It offers a unique “Academic Companion” feature. It breaks down Lily’s course syllabus into manageable segments and created a study plan tailored to her learning speed. It sets reminders for assignment deadlines, arranges study groups with her classmates, and even provides supplementary resources for a deeper understanding of her lessons.

Examinations, a source of stress for many students, are handled innovatively at Beacon. “ExamEase”, the AI-based examination system, creates custom exams for each student, based on their understanding of the subject. The AI tracks a student’s progression throughout the semester, ensuring that the exams test their comprehension and not mere memory.

Social integration is another crucial aspect of university life that Beacon University addresses with its “Social Butterfly” features. It uses common interests hobbies, and preferred social activities to match Lily with potential friends. It also keeps her updated on upcoming university events, clubs, and societies she might be interested in.

Lastly, UniCompanion offers a unique feature called “Professor Connect”, fostering a better relationship between students and professors. It helps Lily schedule meeting with her professors based on mutual availability, preps her for what to discuss, and ensures a constructive conversation.

As Lily navigates through her first semester, UniCompanion becomes an indispensable tool, making her transition into university life smooth and enjoyable. The foreign environment soon becomes a second home for Lily. Despite her initial apprehensions, she confidently engages in her academic life and explores her social interests, making new friends and even joining the university soccer team.

A lesson in adaptability - the AI-enhanced classroom

In the sunny state of California, nestled in the city of Berkeley, is the innovative Westridge University, a pioneer in AI-integrated education. Here, a sophomore student named Omar is about to embark on a journey into the heart of the AI-enhanced classroom.

Omar's major is in Biomedical Engineering, a subject traditionally challenging to master due to its interdisciplinary nature, blending medicine, biology, and engineering. However, the AI-enhanced learning at Westridge University completely transforms Omar's learning experience.

The heart of the AI integration is an advanced system named "Knowledge Navigator", or "KNav", that is designed to personalize Omar's learning experience. KNav begins by analysing Omar's academic background, his learning style, pace, and his strengths and weaknesses.

Once KNav forms a comprehensive understanding of Omar, it customizes his lesson structure. Complex topics are broken down into smaller, manageable segments and supplemented with a variety of learning resources. These resources range from interactive diagrams and simulations to explainer videos and real-world case studies.

One unique feature of KNav is its ability to deliver real-time feedback. During his self-study hours, Omar engages with AI-created exercises and problems. If he makes a mistake, KNav immediately points it out and provides a detailed explanation. This instant feedback allows Omar to learn from his errors on the spot, reinforcing his understanding of the subject matter.

The AI integration also profoundly affects the relationship between students and professors. Traditionally, professors had to cater to a wide spectrum of students in a single classroom, making personalized education a challenge. With KNav, the AI handles the personalization aspect, allowing professors to focus on fostering an engaging and interactive learning environment.

One instance of this is through "Professor Connect", an AI tool that enables students to set up one-on-one meetings with their professors. For Omar, these sessions become a platform for in-depth discussions, clearing doubts, and gaining insights beyond the curriculum.

The AI system also shares a student's learning progress with the professor, including areas of strength and topics they struggle with. This allows professors to understand their students better and provide more specific guidance. For Omar, this meant receiving precise advice on tackling challenging aspects of his course.

Moreover, the integration of AI encourages a more collaborative classroom environment. With AI handling administrative tasks like grading and discussions,

hands-on workshops, and other collaborative activities. This leads to a more engaging and enriching classroom experience for Omar.

A new measure - the Revolution of exams with AI

In the heart of New York City, a third-year student named Sofia, studies Neuroscience at the prestigious Hudson University. As midterms approach, Sofia, like many other students, begins to feel the familiar pang of the exam stress. However, Hudson University has recently adopted an innovative, AI-powered system named ExamEase, aimed at transforming the examination experience.

ExamEase is built on the premise that every student is unique, and the traditional one-size-fits-all approach to exams can often hinder a student's ability to fully demonstrate their understanding. With ExamEase, this no longer becomes a concern for Sofia.

The foundation of ExamEase is a deep understanding of Sofia's academic progression. It tracks her learning over the semester, noting the areas she grasps quickly and those she struggles with. Instead of a fixed syllabus, ExamEase uses this information to generate a personalized examination for Sofia. The questions are tailored to assess her understanding, application, and analysis of the course material.

ExamEase also revolutionize the way Sofia prepares for her exams. It generates predictive questions based on her learning trajectory, allowing Sofia to have a focused revision. Furthermore, it provides immediate feedback. Explaining the correct answers and guiding her on how to improve.

The AI system doesn't stop there. Recognizing that exam anxiety can often hamper performance, ExamEase integrates techniques to help Sofia manage her stress. It includes short mindfulness exercises before the start of the exam, reassuring prompts during challenging sections, and constructive feedback at the end, highlighting her strength and areas for improvement.

The introduction of ExamEase also changes the dynamics of the student-professor relationship during the examination period. Previously, professor were burdened with task of creating, grading, and providing feedback for exams. Now, they can utilize this time to offer personalized support to their students.

For Sofia, this means having a pre-exam discussion with her professor, focusing on her understanding of the subject rather than memorizing facts. Post-exam, her

professor reviews the AI-generated feedback with her, offering further insights and ensuring Sofia's continual improvement.

The implementation of ExamEase transforms Sofia's midterm experience. Instead of being a source of stress, it becomes an opportunity for her to gauge her understanding, gain insightful feedback, and develop effective study strategies. It's a radical change from her previous experiences, making her feel more confident and prepared.

Bridging the gap - a new era in student-professor relations

In the historic city of Cambridge, Massachusetts, a postgraduate student named Alex pursues his Master's in Astrophysics at the revered Harwell University. As Alex delves deeper into his research, he often finds himself seeking the guidance and insights of his professors. Harwell University has recently implemented an AI-enhanced system named "Professor Connect", designed to foster a more robust student-professor relationship, and Alex is among the first to experience its benefits.

Professor Connect operates on the understanding that every student has unique needs and that productive interaction with professors can significantly enhance their academic journey. For Alex, who's deeply involved in research, this tool is a game-changer.

Professor Connect uses an AI-driven scheduler that takes into account both Alex's and his professor's routines. It identifies mutually convenient slots for meetings, eliminating the time-consuming back-and-forth of scheduling. For Alex, this means more regular and structured interactions with his professor, allowing him to discuss his research progress, clarify doubts, and seek guidance.

Furthermore, Professor Connect has an innovative "Prep for Connect" feature. Prior to his meeting, Alex inputs the topics he wishes to discuss. The AI system helps him structure his thoughts, offers suggestions to frame his queries more effectively, and provides background resources to ensure a productive conversation. This preparation allows Alex to make the most of his meetings, leading to deeper discussions and valuable insights.

The AI system also aids the professors. It offers a quick recap of the previous meetings, the student's academic performance, their areas of struggle, and the points to be discussed in the upcoming meeting. This allows the professors to provide specific guidance and foster a more personal relationship with their students.

Professor Connect also offers a feature named "Connect Plus". It's a platform where professors can share additional resources, industry updates, and opportunities like internships, workshops, and seminars. For Alex, this becomes a treasure trove of

valuable information that supplements his academic learning and keeps him updated on the latest advancements in his field.

The integration of Professor Connect reshapes Alex’s academic experience at Harwell. It not only enhances his relationship with his professors, but also enriches his learning, research, and overall development. His interactions with his professors evolve from occasional guidance sessions to a continuous, constructive dialogue, significantly impacting his academic progression and future career in Astrophysics.

United in diversity -the AI champion of inclusivity and equality

In the culturally vibrant city of Toronto, Canada, at the progressive Maplewood University, a first-year student named Amina embarks on her academic journey. As an international student from Senegal and a wheelchair user, Amina’s concerns extend beyond the usual freshman apprehensions. However, Maplewood has recently implemented an AI-based system named “UnityAI”, designed to promote inclusivity and combat discrimination, ensuring a welcoming environment for all students.

UnityAI is built around the principle that diversity enriches the educational experience and that all students should have equal opportunities. It begins by understanding each student’s unique needs. For Amina, this includes physical accessibility needs, language support, and cultural integration.

The AI system starts by helping Amina with her class schedule. It considers not just her academic preferences, but also the accessibility of the buildings where her classes are held. Using the university’s detailed accessibility maps, UnityAI ensures that Amina’s classes are in buildings that are wheelchair accessible and equipped with all necessary facilities.

Language support is another feature of UnityAI . As English is not Amina’s first language, the AI tool offers real-time translation and transcription services during lectures. This support extends to her assignments, offering assistance with grammar, vocabulary, and academic writing convention.

Cultural integration is a crucial part of Amina’s experience at Maplewood. UnityAI helps her by connecting with the university’s cultural societies, where she can meet students from diverse backgrounds, including fellow Senegalese students,. The AI system also keeps her updated on cultural events, fostering an appreciation of multiculturalism within the university.

UnityAI also plays a significant role in combating discrimination. The system has a feature called “SpeakUp”, an anonymous reporting platform where students can report instances of bias or discrimination. The AI ensures that these reports reach the appropriate university official swiftly and efficiently, triggering prompt action.

Additionally, UnityAI works closely with professors to promote inclusive teaching practices. It provides insights into each student's unique needs, allowing professors to tailor their teaching methods accordingly. For Amina, this means her professors ensure all class materials are in accessible formats and that class discussions respect and acknowledge cultural diversity. The integration of UnityAI transforms Amina's university experience. She feels welcomed, valued, and included, allowing her to fully participate in the academic and social life at Maplewood. The concerns she had as an international student with a disability are addressed effectively, making her feel respected and supported.

Mastering the art of learning - AI in hard skills development

Set against the beautiful backdrop of the Rocky Mountains, in the tech-forward city of Boudles, Colorado, a senior-year student named Ethan is making stride in Computer Science at the innovative Sierra University. Ethan's primary goal is to perfect his hard skills, specifically programming, machine learning, and data science. Sierra's state-of-the-art, AI-powered system, SkillMaster, is designed to aid students like Ethan in mastering these hard skills.

SkillMaster operates on a multi-pronged approach. It recognized that hard skills, particularly in technical fields, require both a strong theoretical understanding and practical application.

The AI begins by customizing Ethan's learning path based on his current skill level and desired goals. For a complex concept like machine learning, SkillMaster breaks down the topic into manageable subtopics. It creates a flexible learning plan, complete with engaging video tutorials, interactive coding tasks, and advanced reading materials. Each resource is tailored to Ethan's individual learning style and pace, ensuring that he thoroughly grasps the concepts.

However, understanding the theory is only half the battle. SkillMaster then allows Ethan to apply his knowledge through a wide array of real-world projects. These projects, sourced from various industries, offer Ethan an opportunity to see how his skills can solve actual problems. The AI system provides step-by-step guidance throughout these projects, while also allowing Ethan the flexibility to experiment and learn.

SkillMaster also includes an AI tutor, available 24/7. Whenever Ethan encounters a problem or error in his coding assignments, the AI tutor provides instant, precise feedback. It not only points out the error, but also explains why it occurred and how to rectify it. This instant feedback system makes learning a more interactive and dynamic process.

Furthermore, SkillMaster utilizes advanced AI algorithms to conduct regular assessments of Ethan's progress. These assessments are adaptive, becoming more challenging as Ethan's skills improve. They are designed not just to test his understanding, but also to push him to learn more.

SkillMaster's impact extends beyond Ethan's university life. It also assists in building his professional portfolio. Upon completion of each real-world project, the AI system helps Ethan document his work, highlighting the skills he used and the problems he solved. This professional portfolio becomes a testament to Ethan's hard skills, making him a competitive candidate in the job market.

The art of subtlety - AI in soft skills enhancement

In the cultural rich city of New Orleans, Louisiana, a junior-year student named Amelia is studying Sociology at the renowned Delta University. While Amelia excels in her academic pursuits, she feels a need to improve her soft skills - namely communication, leadership, and empathy. To aid students like Amelia, Delta University has recently adopted an AI-based system named "PersonaAI" specifically designed to enhance these subtler, but no less critical, aspects of personal development.

PersonaAI operates on the understanding that soft skills are not just about knowledge, but also about practice and reflection. For each skill, it creates a comprehensive development path, combining learning resources, real-time feedback, and reflective activities.

To enhance Amelia's communication skills, PersonaAI starts by offering a range of resource, including video tutorials, online workshops, and literature. These resources cover various aspects of communication - both verbal and non-verbal, one-on-one conversations and public speaking, written and digital communication.

PersonaAI also provides practical exercises where Amelia can apply her learnings. These exercises range from simulated conversations to virtual public speaking events. The AI uses advanced speech recognition and semantic analysis to give Amelia real-time feedback on her performance. It points out areas of improvement, such as tone modulation, clarity of speech, and body language, helping Amelia improve continuously.

When it comes to leadership skills, PersonaAI uses a blend of theoretical and hands-on approaches. Amelia participates in virtual team activities where she takes on different leadership roles. The AI system guides her through these tasks, offering advice on team management, decision-making, and conflict resolution. It also provides reflective exercises to help Amelia understand her leadership style better and identify areas for improvement.

Empathy, though a more complex and abstract soft skill, is not beyond PersonaAI's capability. It uses immersive virtual reality (VR) scenarios to help Amelia understand different perspectives and learn empathetic responses. For example, she might be placed in a VR scenario where she has to navigate a conflict between two friends. The AI guides her through these scenarios, helping her recognize and respond to the emotions of others appropriately.

PersonaAI also facilitates a peer-feedback system. After each group activity, Amelia and her peers review each other's performance, providing constructive feedback. This helps Amelia gain insights into how others perceive her skills, contributing to her overall growth.

Graduation unveiled - the AI path to the future

Located in the heart of Silicon Valley, the tech-forward Liberty University is home to a final-year student named Liam, who is studying Biomedical Engineering. As graduation looms, Liam is faced with a multitude of decisions about his future. To streamline this complex process and aid students in their transition into the professional world, Liberty University has implemented an AI-powered system named "FuturEase".

FuturEase operates on the principle that every student's career path is unique, and therefore, the process of graduation should be customized to suit their individual aspirations and skills.

The AI begins by conducting an in-depth analysis of Liam's academic journey, skills, strengths, and areas of interest. It uses advanced algorithms to map out potential career paths that align with his profile. For each of these paths, it provides a detailed overview, including the scope of the field, potential job roles, and expected salary range.

However, FutureEase goes beyond just providing information. It assists Liam in making informed decisions by connecting him with alumni who have pursued similar paths. Through these interactions, Liam can gain insights into the reality of these careers, aiding him in his decision-making process.

Once Liam decides on his path, FuturEase guides him in preparing for it. For instance, if he chooses to apply for jobs, it assists him in tailoring his resume and cover letter for each application, optimizing them with keyword analysis to beat the ATS (Applicant Tracking System) algorithms. It also offers a suite of interview preparation resources, including common questions, tips, and mock interviews with instant feedback.

If Liam decides to pursue further education, FuturEase helps him navigate the application process. It identifies suitable programs based on his profile, aids him in

writing a compelling Statement of Purpose, and prepares him for potential interview questions.

Furthermore, FuturEase takes into consideration that graduation is not just about career transitions. It recognized the emotional and mental stress that students often face during this period. To combat this, the AI system includes a wellness component, offering mindfulness exercises, stress management techniques, and even arranging counselling sessions if needed.

The introduction of FuturEase transforms Liam's graduation process. Instead of being a source of anxiety and confusion, it becomes a structured, personalized journey, guiding him step by step towards his future.

Learning reinvented - the AI revolution in Academic resources

In the coastal city of Santa Barbara, California, nestled amidst palm trees and overlooking the Pacific, the modern campus of Pinnacle University is bustling with students. Among them, a sophomore named Zoe is majoring in Environmental Science. To navigate her way through complex courses materials, Zoe leans on "InfoDive", an AI-based system launched by the university to streamline and personalize academic resources.

InfoDive operates under the principle that learning is not one-size-fits-all. Therefore, it personalizes academic resources to match each student's unique learning style and pace. It begins by understanding Zoe's learning preferences through a series of assessments and tracking her study patterns.

Armed with this understanding, InfoDive tailors Zoe's textbook content. It uses Natural Language Processing (NLP) to cover text into audio for when she prefers to learn by listening. For visual learning, it presents the content in interactive formats, such as infographics, diagrams, and animations.

However, InfoDive doesn't stop at textbooks. It extends to a wide array of academic resources. Using its extensive database, the AI system recommends relevant research papers, articles, documentaries, and even podcasts, diversifying Zoe's learning materials.

Moreover, InfoDive includes an AI tutor available 24/7. Whenever Zoe struggles with a concept, the AI tutor breaks it down into simpler, understandable chunks. It guides her thorough the topic step by step, adapting its explanations based on her comprehension.

To ensure Zoe's learning is effective, InfoDive regularly assesses her understanding through quizzes and assignments. These assessments are adaptive, growing more

challenging as Zoe's comprehension improves. Each assessment is followed by detailed feedback, pinpointing her strengths and areas for improvement.

Furthermore, InfoDive utilizes machine learning to continuously improve its services. By analysing Zoe's study patterns, comprehension rate, and feedback, the AI system fine-tunes its strategies and recommendations to enhance her learning experience.

As Zoe navigates her academic journey, InfoDive proves to be an invaluable ally. It not only makes her study sessions more efficient, but also enriches her learning, leading to a deeper understanding of her major.

The knowledge compass - AI in library and research

Nestled between the rolling hills of the English countryside is the prestigious Northbridge University. Among its many students, a third-year doctoral candidate named Maya is knee deep in research for her dissertation in History. To aid students like Maya, Northbridge has incorporated an AI-driven system, "LitNavigator", designed to streamline the process of academic research.

LitNavigator operates under the belief that research is not just about access to information, but about finding the right information efficiently. It starts by understanding the research topic from Maya, which in her case is "The influence of women in the European era".

Armed with this information, LitNavigator dives into the vast ocean of academic resources. Using Natural Language Processing (NLP) and Machine Learning algorithms, it shifts through thousands of books, journals, articles, dissertations, and multimedia content. It identifies and prioritizes resources that are most relevant to Maya's research.

However, LitNavigator does not just hand Maya a massive list of resources. It takes a step further to organize these resources based on their relevance, the prominence of the publishing source, and the date of publication. It also provides a brief summary of each resource, allowing Maya to quickly gauge its usefulness before diving in.

Moreover, LitNavigator integrates with the university's library system. For each identified resource, it provides the physical location if it's a book available in the library or a direct link if it's a digital resource. If a required book is checked out or a digital resource is restricted, the AI system notifies Maya when it becomes available.

Perhaps, the most remarkable feature of LitNavigator is its ability to highlight intersections between different resources. It points out where and how different sources connect or disagree, thereby helping Maya in drawing a comprehensive picture of her research topic.

Beyond the research phase, LitNavigator assists Maya in citation management. It automatically generates and manages citations for her resources, reducing the tedious manual work involved in building a bibliography.

In Maya's journey, LitNavigator transforms the daunting task of academic research into a smooth, navigable process. It not only helps her find the right resource, but also aids in understanding the broader narrative and maintaining ethical research practices.

LaunchPad - AI driven Internship and Job Placement

Located in the bustling heart of New York City, the innovative Metropolis University is preparing the leaders of tomorrow. Among the diverse student body is a final year computer science student named Ethan. Like many students nearing graduation, Ethan is seeking for an internship that would serve as a springboard for his professional career, Metropolis University, in collaboration with AI-based platform "LaunchPad", aims to simplify this process for its students.

LaunchPad operates under the belief that every student's career path is unique. It uses sophisticated algorithms to match students with potential internships or job opportunities based on their skills, interests, and long-term career goals.

The AI begins by conducting an in-depth evaluation of Ethan's academic performance, extracurricular activities, skills, and interests. Using this data, LaunchPad maps out a comprehensive profile of Ethan. Simultaneously, it collects and analyses data from a plethora of businesses seeking interns or fresh graduates, taking into account factors such as job role, company culture, and career growth opportunities.

Using advanced matching algorithms, LaunchPad then aligns Ethan's profile with potential opportunities. It provides him with a curated list of internships that not only match his academic qualifications and skills, but also align with his personal interests and career aspirations.

However, LaunchPad doesn't stop at just recommending opportunities. Once Ethan decides on his preferred internships, the AI assists him throughout the application process. It helps him tailor his resume for each application, highlighting his most relevant experiences and skills. It also assists in writing cover letters, providing templates and personalized suggestions.

In preparation for interviews, LaunchPad offers a comprehensive suite of resources. It provides common interview questions and tips specifically targeted towards the company and role Ethan is applying for. It also offers mock interview with instant AI-driven feedback on his responses, body language, and voice modulation.

Even after Ethan secures an internship, LaunchPad continues to support him. It provides guidance on how to make the most of the internship, setting goals, and effectively networking within the company.

Through Ethan's journey, LaunchPad transforms the complex process of securing an internship into a personalized, efficient, and educational experience. It not only helps Ethan land an internship that aligns with his goals, but also equips him with the skills needed to succeed in it.

MindEase - AI as the compassionate caretaker of mental health

Located in the picturesque city of Vancouver, Canada, Pacific Bay University is home to a diverse community of students from all over the globe. Among these students is Anna, a first-year international student grappling with homesickness, culture shock, and the pressure of academic life. To help students like Anna, the university has introduced a ground-breaking AI system named "MindEase".

MindEase operated under the principle that mental health is just as crucial as physical health and academic success. It serves as a virtual mental health companion, available 24/7, offering support and resources to help students navigate their emotional landscape.

MindEase starts its journey with Anna by getting to know her. It assesses her emotional state through regular check-ins and prompts her to reflect on her feelings. It provides a safe, judgement-free space for Anna to express herself, with complete confidentiality guaranteed.

When Anna feels overwhelmed, MindEase guides her through mindfulness exercises and stress management techniques. It offers personalized recommendations, such as breathing exercises, progressive muscle relaxation, or even a calming playlist, based on her current emotional state.

However, MindEase is not just a crisis companion. It helps Anna maintain her emotional wellness on a daily basis. It suggests healthy habits like regular exercise, good sleep hygiene, and mindful eating, promoting an overall balanced lifestyle.

Perhaps, the most significant feature of MindEase is its ability to detect when a situation is beyond its capability. If Anna's distress persists or intensifies, MindEase promptly suggests reaching out to a human counsellor. It provides the contact information of available campus counsellors and facilitates the scheduling of appointments, making sure that Anna receives the help she needs.

Moreover, MindEase also serves as an educational tool, raising awareness about various mental health issues. It debunks common myths, shares inspiring stories, and reinforces the importance of seeking help when needed.

In Anna's journey, MindEase proves to be a comforting companion, helping her navigate the ups and downs of university life. It empowers her to take control of her mental well-being, ensuring she never feels alone in her struggles.

SafeGuard - AI enhancing physical health and campus safety

In the heart of Silicon Valley, stands the illustrious Pioneer University, known for its technological innovations and healthy learning environment. Among the many techs-savvy students is Ben, a freshman keen on maintaining a balanced lifestyle while adapting to his new environment. To ensure the safety and well-being of students like Ben, Pioneer University has incorporated "SafeGuard", an AI-driven system designed to oversee physical health and campus safety.

SafeGuard operates under the principle that a safe and healthy environment is key to optimal learning. It integrates a network of smart sensors, wearables, and mobile applications, creating a comprehensive system focused on proactive health management and campus safety.

At the start of the academic year, Ben is provided with a smart wristband. It continually monitors his vitals, activity levels, sleep patterns, and more, providing personalized insights and recommendations to maintain his physical health. It alerts him if he's been sitting too long, if his hydration levels are low, or if he needs a better night's sleep, for example.

SafeGuard also interfaces with the campus gym and other recreational facilities. It recommends tailored workout regimes, yoga classes, or meditation sessions based on Ben's physical health data and preferences. For any health concerns, SafeGuard connects Ben to the campus health centre, enabling online consultations and easy appointment scheduling.

On the safety front, SafeGuard employs a network of AI-powered CCTV cameras across the campus. These cameras leverage machine learning algorithms for real-time monitoring and anomaly detection. They can identify potential security threats or unusual activities, triggering alerts to campus security, ensuring prompt actions.

SafeGuard also comes with an emergency feature on Ben's wristband and mobile application. In case of any distress, Ben can trigger an SOS, and his real-time location is shared with the campus security, who can then respond immediately.

Moreover, SafeGuard ensures adherence to health protocols, particularly important in times of a health crisis, like a pandemic. It can monitor crowd levels in different

areas of the campus, ensuring social distancing norms are met, and can also track and remind students of vaccination schedules or health check-ups.

In Ben's journey, SafeGuard serves as a diligent guardian, watching over his health and safety as he navigates his way through university life. It not only empowers him to take control of his physical well-being, but also ensures that he feels safe and secure on campus.

MoneyWise - AI empowering financial independence

Nestled in the outskirts of Chicago, the renowned Midwest University prides itself on offering a high-quality education and fostering self-reliance among its students. One of these students is Chloe, a sophomore who, like many others, is juggling her studies with managing her finances. To help students navigate this often overwhelming task, Midwest University has partnered with an AI-driven financial planning system named "MoneyWise".

MoneyWise operates under the principle that good financial health is vital for a stress-free university life. It serves as a personalized financial guide, providing students with tools to budget, save, and spend wisely.

At the start of the semester, Chloe sits down with MoneyWise to outline her financial situation. She enters her income from her part-time job, her financial aid, her savings, and her projected expenses, including tuition, rent, books, food, and personal expenses.

Using this information, MoneyWise develops a personalized budget for Chloe, allocating funds to different categories while ensuring she has a buffer for unexpected expenses. It sends her regular updates and alerts when she nears her spending limit in any category.

But MoneyWise isn't just about tracking expenses and setting budgets. It offers financial education, explaining concepts like interest rates, loans, and savings accounts in a user-friendly way. It helps Chloe understand where her money is going and how to make it work for her.

Moreover, MoneyWise assists Chloe in seeking out scholarships and financial aid opportunities that she may qualify for, and reminds her of important application deadlines. It also provides her with a projection of her student loans, giving her a realistic picture of what her financial obligation would be upon graduation.

Perhaps, the most significant feature of MoneyWise is its ability to adapt to Chloe's evolving financial situation. It recalibrates her budget and savings goals based on

changes in her income or expenses, ensuring her financial plan remains relevant and feasible.

In Chloe's journey, MoneyWise becomes an invaluable tool, taking the stress out of financial management and empowering her to take control of her financial future. It not only helps her manage her money, but also equips her with the skills and knowledge to make informed financial decisions.

AlumNet - AI nurturing alumni engagement

Located on the sunny coast of California, the esteemed Pacifico University has been producing industry leaders and change-makers for decades. Among its illustrious alumni is Carlos, a successful entrepreneur and proud Pacifico graduate. To foster a vibrant, interactive alumni community, Pacifico University utilizes an AI-driven platform named "AlumNet".

AlumNet operates under the belief that the relationship between a university and its alumni should be a lifelong bond. It acts as a virtual bridge, connecting alumni with the university and each other, promoting a sense of belonging and mutual growth.

Upon graduation, Carlos is introduced to AlumNet. He's prompted to create a profile, inputting details about his academic history, career progress, current city, and interests. AlumNet uses this data to personalize Carlos experience, providing him with content and connections that are relevant and meaningful to him.

Using advanced machine learning algorithms, AlumNet connects Carlos with fellow alumni who share similar interests, live in the same city, or work in the same industry. It fosters networking and mentorship opportunities, leading to potential collaborations and friendships.

Moreover, AlumNet keeps Carlos engaged with the university's current happenings. It shares news updates, research breakthroughs, and upcoming events. It tailors this information based on Carlos' interests, ensuring he only receives content he cares about. For instance, if he was a member of the robotics club, AlumNet will share updates on the club's activities and achievements.

Perhaps, the most impactful feature of AlumNet is its ability to facilitate alumni contributions. It enables Carlos to give back to his alma mater in various ways, such as mentorship programs, guest lectures, or scholarship funds. It connects him with current students who could benefit from his guidance, thereby fostering a cycle of giving back.

Moreover, AlumNet uses predictive analytic to suggest when Carlos might be most receptive to fundraising campaigns, making the process more efficient and respectful of his time and interests.

In Carlos' journey, AlumNet helps him stay connected with his alma mater and fellow alumni, fostering a sense of community and continuity. It not only keeps him engaged with the university, but also provides avenues for him to contribute to its growth and success.

ProfAssist - AI simplifying the life of professors

Tucked away in the serene hills of Vermont, the progressive Green Mountain University serves as an incubator for innovative teaching methodologies. Among its forward-thinking faculty is Professor David, a seasoned academic, passionate about imparting knowledge in the field of environmental science. To aid educators like David, the university has introduced "ProfAssist", an AI-powered platform designed to streamline academic duties and enhance teaching effectiveness.

ProfAssist operated under the belief that an educator's role extends beyond delivering lectures; it encompass research, mentoring, and administrative tasks. The platform aims to alleviate these multidimensional responsibilities, allowing professors to focus more on student engagement and personal research.

For David, ProfAssist becomes an invaluable aid right from the start of the semester. It helps him design the course syllabus, tailoring the curriculum based on the learning pace and interests of his students. It curates the most relevant and updated reading materials from various databases, keeping the course content engaging and current.

During class hours, ProfAssist provides real-time transcription and translation services, catering to international students and making the classes more accessible. It also analyses student engagement through their facial expressions and participation, giving David insights on which topics might need in-depth explanation or different teaching approach.

ProfAssist also revolutionizes David's grading process. Using AI, it can accurately grade multiple-choice exams and even evaluate written assignments based on grammar, coherence, and argument structure. It provides constructive feedback on each student's work, saving David considerable time and ensuring fairness in grading.

When it comes to research, ProfAssist acts as David's personal assistant. It keeps track of the latest publications in his field, summarizes key findings, and even suggests potential areas for his research. For conferences and seminars, it manages

David's calendar, schedules his travel, and even prepares preliminary drafts of his presentations.

Perhaps, one of the most transformative aspects of ProfAssist is its role in student mentoring. It helps David keep track of each student's academic progress, highlighting those who might be struggling. It also facilitates easy communication between David and his students, providing a platform where students can ask questions or seek guidance outside of class hours.

In David's journey, ProfAssist transforms his academic duties from a juggling act to a well-orchestrated symphony. It allows him to efficiently manage his responsibilities while providing more opportunities for direct student engagement and personal research.

Ca' Foscari 2028 - an AI Renaissance

Founded on Gran Canal in 1868, the historic Ca' Foscari University of Venice has always been a hub of intellectual growth and innovation. In 2028, the university welcomes Alessandra, an enthusiastic freshman ready to embark on her journey in International Business and Economics. To make this journey enriching and seamless, Ca' Foscari has incorporated an AI-driven ecosystem named "La Fenice".

La Fenice, named after the famous Venetian opera house symbolizing rebirth, operates under the belief that AI is the new renaissance in higher education. It integrates various AI tools and systems designed to facilitate the academic journey, ranging from personalized education to campus safety.

Upon Alessandra's arrival at Ca' Foscari, La Fenice curate a personalized orientation program to familiarize her with the university, her chosen program, and the vibrant city of Venice. It assesses her academic background, interests and strengths to recommend elective courses and extracurricular activities.

When it comes to academic assistance, La Fenice comes equipped with a virtual tutor named "Vittorio". Vittorio is available 24/7 to clarify doubts, provide in-depth explanation, and offer study strategies. It even customizes Alessandra's learning content based on her comprehension level and learning style, making the learning process more engaging and effective.

In the classrooms, professors leverage AI to enhance their teaching methodology. Real-time transcription and translation services make lessons accessible for international students. AI-powered analytic provides insights on student engagement, enabling professors to adjust their teaching approach for optimal learning outcomes.

Outside of academics, La Fenice contributes significantly to campus life. It manages a smart library where students can access digital copies of textbooks, research papers, and historical archives. An AI-driven health and safety system oversees campus security and encourages healthy living habits among students.

La Fenice also plays an essential role in career guidance. It continually updates Alessandra on internships, study abroad opportunities, and job openings that align with her field of study and career aspirations. Moreover, it helps her prepare for these opportunities by offering AI-powered mock interviews and resume enhancements.

At the end of Alessandra's journey, when she becomes an alumna, Ca' Foscari's AI system ensures she remains a part of the university's fabric. It connects her with current students for mentorship opportunities and keeps her updated on university happenings.

What all those stories have in common in the solutions they offer, stand in the ability not to alienate human from the process, but instead to keep human in the centre. Everything is planned to be human-focused! What changes is the work load.

AI rethinks and reorganizes university in a more agile way-of-doing things, keeping up the main purpose and role of the university and its members themselves. The incredible revolution in the solutions provided stands in the ability to change everything, without changing.

Conclusion

This thesis touches different points, apparently independent, but in reality strictly correlated.

We've introduced the analysis with a useful interpretation key, presenting the actual society with the three dominating and more used words: technology, innovation and hyper-connectivity.

We've also investigated three actual economic models that exist because of the three words in the background. Those models are the Solow Model, the Growth Economic Model, and the Fourth Industrial Revolution model.

The introduction has been the necessary step to deeply understand how university and artificial intelligence are part of them.

The first chapter is focused on university, making a comparison among the Italian University system and the top-qualified University system worldwide. Overall, we can state that the Italian University system is ranked above the sufficient level, but we still have a lot to work on. What's worst is the absence of the Italian educational level in the top-levels of whatever global statistics.

The second chapter is a presentation of AI, its uses and its assumptions. The impact of AI is already affecting us, but because of its early stage of development, we haven't got a clear view of where it is going to take us. This brings to doubts and worries about the future, intimidating the exploration and further adoption of this tool in our lives.

The last chapter is a concrete example of what AI can do and of how many inputs can provide humans.

Could you imagine how much your creativity would work if an AI system suggests you a tool to make student life easier? Or professor work stress-free? How would you implement it? But even more, would you ever thought about it?

Sometimes we face problems way before to understand they actually are problems. And we often recognize the deepest of them when they are bigger and harder to deal with. Adding the set in speed to limit the problem spreading and exasperation, it's common to end up by facing enormous issues that bring with them injuries and damages. As time passes, new problems are added to the previous ones not already solved. It's an endless waterfall that results in inefficiency, inconsistency and incapacity. The attitude is global, and some countries are more prone to manifest it more than others.

Talking about the university system, the insights provided on a wide range of universities ranked among the top worldwide, still present a significant betterment gap opportunity. The top-range universities could push ahead their boundaries to welcome change and flexibility. Focusing on the Italian system, we can overall state that it's sufficient, but the improvement gap is even greater.

Italian lack is on the way of thinking and seeing itself. We have good structures, nice environment, ideas, willingness to make the difference and a millenari culture to support us. *What's missing?* Probably the need to demonstrate that we can do it by our own, under the common slogan "Italians do it better".

We don't need much data to support the evidence that Italy in the last decades hasn't shined. When talking about new products, systems, innovations and whatever includes to step out of the comfort zone, Italy has the tendency to swing between the late majority and the laggards. It's been years that Italy hasn't gave birth to a significant, discussed, global spread revolution. *Italy, not Italians!* Thanks to brain drain, Italian students have found a favourable place of expression and research, physically, technically, and financially supported, but more important, allowing students to keep dreaming - abroad. But a relevant discovery, a new technology or a breakthrough intuition from Italians aren't *Made in Italy* if incubated somewhere else. *Has the time come to put on practice Italian President of the Republic Sergio Mattarella's words?*

" Nowadays, working abroad shouldn't be a forced choice for anyone, but an opportunity, specifically for young people. [...] It's about moving from the brain drain to the talent circulation, feeding a virtuous circuit of skills and competencies"⁵².

How to retain young?

Filling the existing gap with top-ranked universities should be the first step. Being inspired from them, copying them, asking them for help. Become free in expression, actions and vision.

Tangible aspects are important: structures, facilities, spaces, laboratories can provide students a better approach, research and hand-on the job. But intangible aspects are even more important, because in them stand the power of learning and improving, characterized by the freedom of taking the eyes off the book and explore what hasn't been theorized yet.

Listening to students, the major part of them feel dissatisfaction when talking about university. It's like if the only goal that matter is the final graduation certificate, not the way and the skill-building towards it. Some very common students statements

⁵² Mattarella, S June 2nd, 2023. 2 giugno, il videomessaggio di Mattarella: << Il lavoro all'estero sia libera scelta, non fuga di cervelli>>. June 2nd, Mattarella's video: << Workjng aborad as a free choice, not as brain drain>>. Corriere della Sera <https://video.corriere.it/politica/2-giugno-videomessaggio-mattarella-gli-italiani-all-estero-la-repubblica-siete-anche-voi/8140a75e-0115-11ee-9a47-43166fb70f00>

are “I won’t need to know this topic in my life” and “I’m attending university because I have no alternative option, not because I want to”.

It’s sad!

I know, we know, that university worth more than this.

We can aim for excellence and we can do it using a mix of possible ways. Better-structured universities could be the first, necessary move to address to.

So, how to face top-quality universities gap?

If we get inspired from better systems than ours, but that still face challenges, *how to mitigate this?*

Differentiation. And differentiation always comes with news. The first life part of a new product, system, or tool has an exploitation power in it. Innovators and early adopters largely benefit from catching news as firsts and together with a forward-looking vision, they are able to generate giants in the current markets. Revolution doesn’t born from standard, but from the courage to explore the unknown and see an opportunity in it. And we’re now facing a new tool with a huge potential in it. Chapter 3 wants to provoke readers in evaluating an alternative option together with providing inputs that could make a change if improved. AI is a tool that has broken the boundaries of previous tech-supports, introducing itself as an upper-level of machine analysis and computation. It has the ability to reduce time-effectiveness and increasing the output level. And what’s more important to be aware about is that no matter the opponents, it will develop, spread and move forward. This right moment has the potential to be flourish if caught on time and with the right purpose.

The wave of a new revolution has just started. *Do we want to surf it or to sink?*

Sitography

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